Space Communications Customer Forum (SCCF)

(formerly Mission Services Customer Forum)

http://scp.gsfc.nasa.gov/sccf/

August 12, 2004

Building 3 Goett Auditorium
NASA/Goddard Space Flight Center
Greenbelt, Maryland

Sponsored by:
Customer Commitment Office, Code 451
Space Communications Program, Code 450

Space Communications Customer Forum

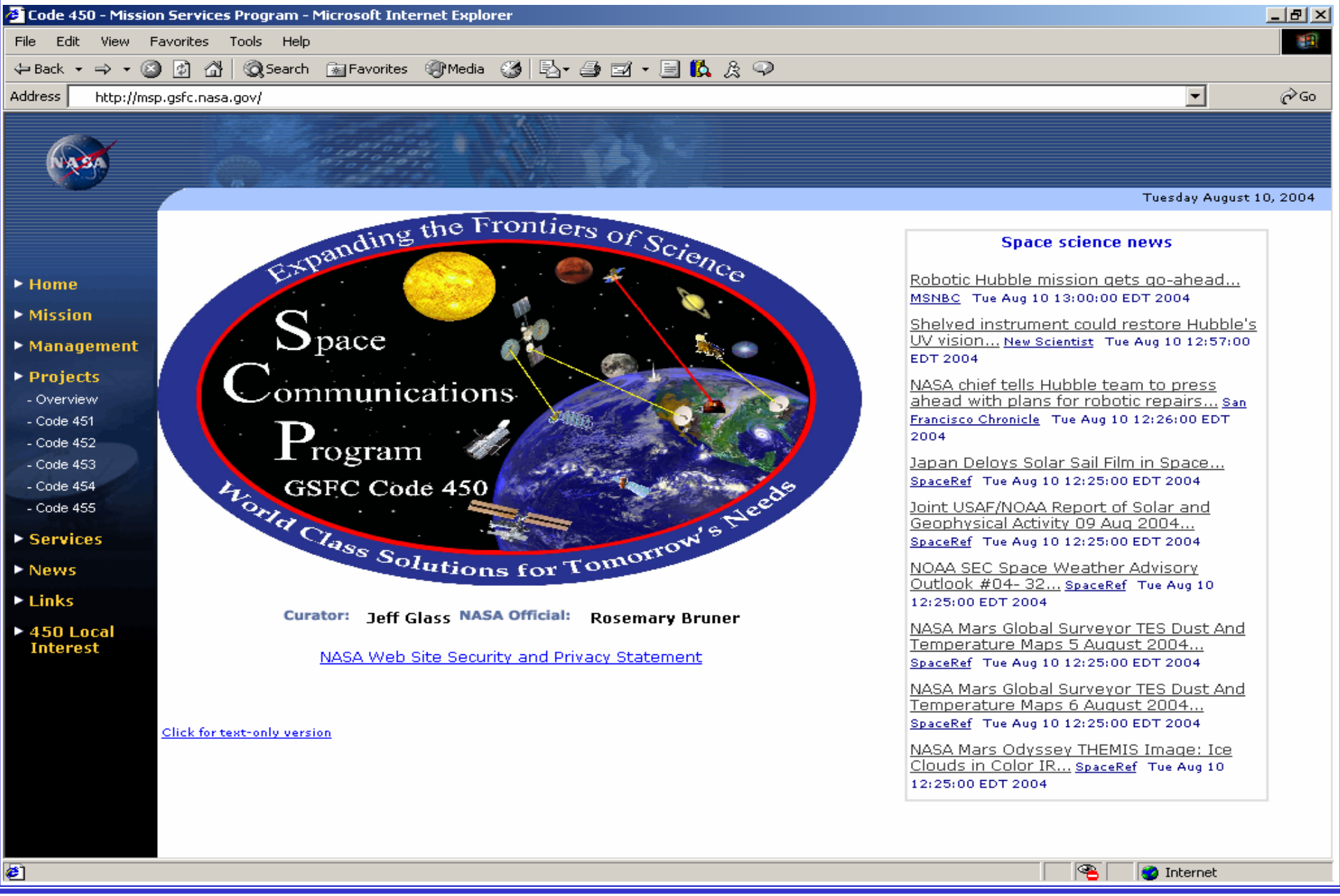
AGENDA

Timeline (approx.)	*Subject / Topic*	*Speaker / Presenter*
1:00pm	WELCOME & INTRODUCTIONS	Allen J. Levine/GSFC/451
1:10pm	OPENING REMARKS	Jon Z. Walker/GSFC/451
1:25pm	ACTION ITEMS AND OPEN FLOOR TOPICS	Allen J. Levine/GSFC/451
1:45pm	FEATURED TOPICS	
	• Space Network (SN) Future Services – Space Network Internet Protocol Services (SNIS) – Fast Forward	David J. Israel/GSFC/567
2:00pm	STATUS UPDATES - *Significant Activity in Space Communications Program (SCP) Offices and Our Partners* -	
	• Ground Network (GN) Project (Code 453))	Roger N. Clason/GSFC/453
	• Space Network (SN) Project (Code 452))	Keiji K. Tasaki/GSFC/452
	• Customer Commitment Office (Code 451)	Jon Z. Walker/GSFC/451
	• NASA Integrated Services Network (NISN) Services – Overview of NASCOM IP Operational Network – NISN Interfaces with Projects for Requirements and Funding	 Norman Reese/USGSA/291 Jerry Zgonc/GSFC/291
	• JPL/Deep Space Mission Systems (DSMS)	Gene Burke/JPL/930
2:50pm	MISSION/PROJECT UPDATES *(Organizational Overviews; Current/Future Missions; Issues & Selected Items of Interest; Areas for More Work)*	
	• Earth Science Missions	Ed Macie/GSFC/428
	• Space Science Missions	Ron Mahmot/GSFC/444
	• Human Space Flight Missions	Jim Bangerter/GSFC/451
3:20pm	CLOSING REMARKS	Allen J. Levine/GSFC/451

WELCOME / INTRODUCTIONS

- Logistics
- Attendance *(please sign attendance sheet)*
- SCCF Survey *(how are we doing?)*
  - (web access @ http://scp.gsfc/nasa.gov/sccf/)
  - Included in 'Briefing Book'
  - Input used to generate metrics
- Remote Participants (Webcast and Teleconference)
  - Confirm participation via e-mail to Michael.Booth@gsfc.nasa.gov
- SCCF Future Plans
  - Next meeting: November 18, 2004 (same location)
  - Splinter group meetings may be incorporated
    - Operations Interfaces, Requirements Documentation, Scheduling, Communications, SCP project offices, etc.

Space Communications Customer Forum



SCP GOALS AND OBJECTIVES

(We are committed to exceeding them!)

- **OUR MISSION**
  - Provide our customers with space operations services and new technology to enable scientific discovery, research, and commercial space development
- **OUR VISION**
  - Foster innovative technologies and provide management services to ensure cost efficient space operations for our customers
- **CUSTOMER SATISFACTION**
  - Provide excellent services and products
  - Meet and exceed needs at a reasonable cost
- **INTEGRITY**
  - Maintain an honest and ethical character
  - Honor commitments
  - Emphasize accountability

Space Communications Customer Forum

- OUR ROLE IN THE TRANSFORMED NASA
  - Forward looking
  - Innovative
  - Expanding horizons
  - Inspirational
- OUR RESOURCES AND PARTNERS
  - Customer Commitment
  - Space Network
  - Ground Network
  - TDRS Project
  - Mars Laser Communication Demonstration
  - Commercial providers
  - NASA Integrated Services Network (NISN)
  - Deep Space Mission Systems (NASA/JPL)
  - International Partners

- OUR SUCCESS CRITERIA:

SATISFIED CUSTOMERS!

ACTION ITEMS

[replace this page/insert 'MSCF-8 RFA-01.doc' file here]

OPEN FLOOR TOPICS

SCHEDULING ISSUES

- Critical Support
  - Definition:
    - Launch and early orbit
    - Orbital or attitude maneuvers (during maneuvers and/or soon after [for tracking data])
    - Commanding/command loads to preclude emergency or “safe hold” conditions
    - Scientific targets of opportunity, such as volcanic eruptions, supernovas
    - Rendezvous or docking operations
    - EVA
    - Atmospheric re-entry/de-orbit
    - Safe hold activities
  - “Good Neighbor Policy”: declare only criticals as “critical” and provide as early as possible

SCHEDULING ISSUES *(cont.)*

- Launch slip rescheduling
  - New policy for GN: cover only the first 24 hours initially
    - Cuts down on workload and still will provide required support
- Reemphasize request input at beginning of Forecast work week

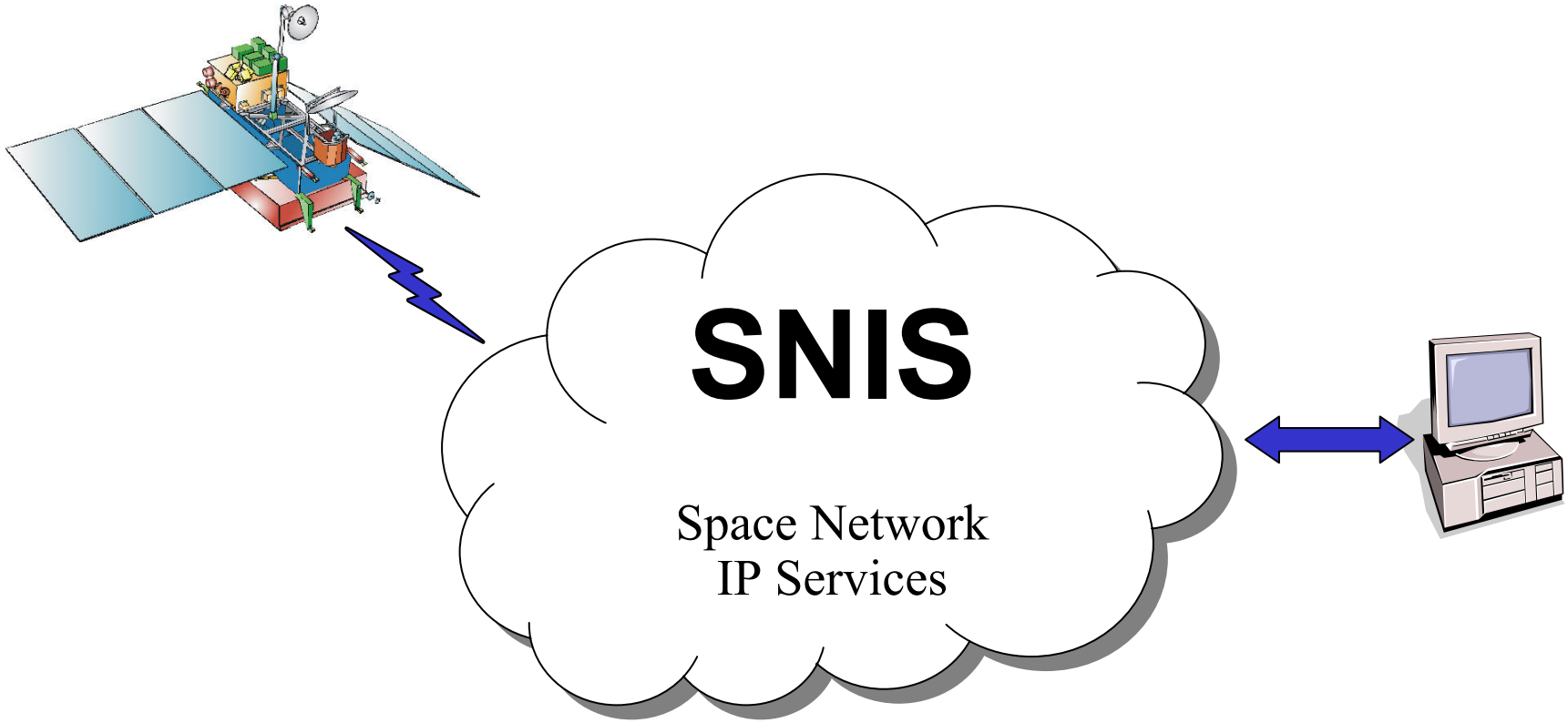
OPEN FLOOR

Space Network (SN) Future Services

- Space Network Internet Protocol Services (SNIS)
- Fast Forward

Dave Israel
GSFC/Code 567
NASA/Goddard Space Flight Center

Space Network Internet Protocol Services (SNIS)

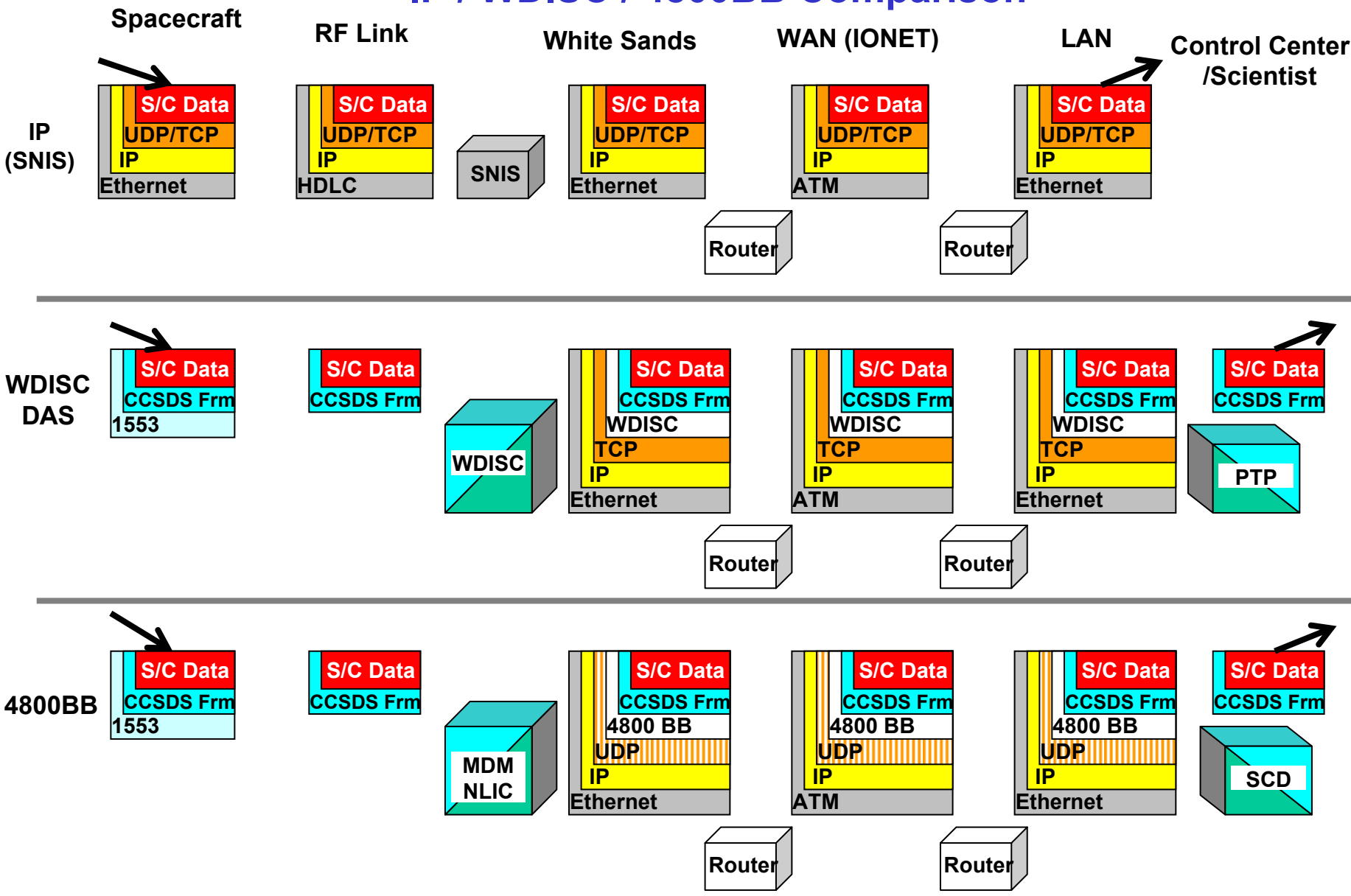


What is SNIS?

- SNIS is an SN Product that will accomplish the following:
  - Makes spacecraft systems look and operate just like any other nodes on the IONET
  - Provide operational IP services that were previously supported in test and demonstration modes
  - Enables end-to-end, standard IP communication between all mission resources (e.g. spacecraft, control center, Principal Investigators (PIs))
- SNIS will be a new option for future missions. It is not a replacement for any current systems.

Space Communications Customer Forum

IP / WDISC / 4800BB Comparison

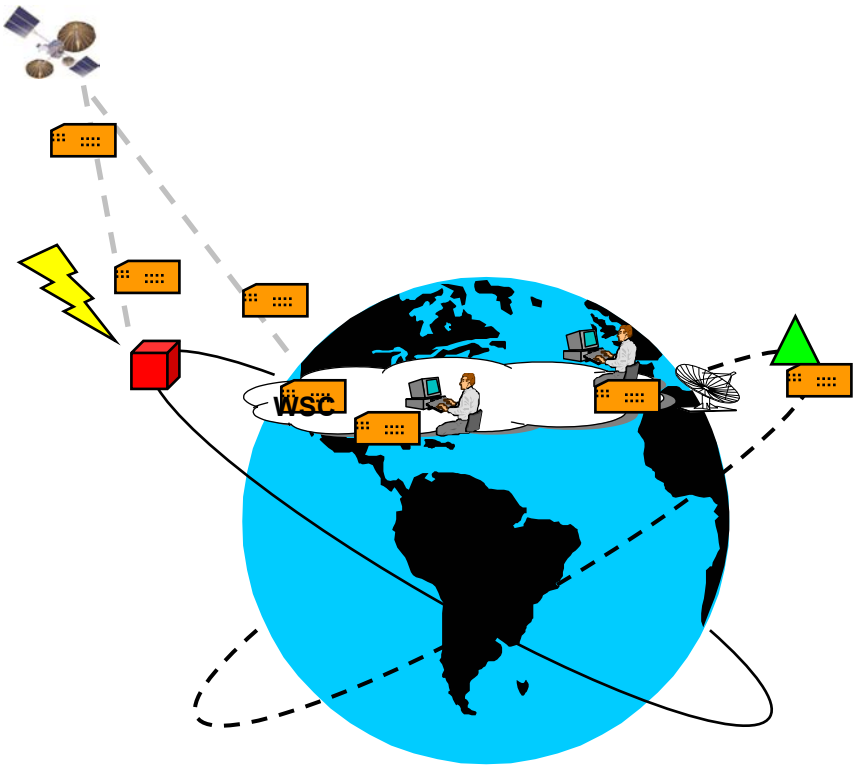


SNIS-WDISC Comparison

- WDISC & DAS PTPs provide a gateway between the RF link and TCP/IP on the IONET
  - Spacecraft indicates source of data (e.g., SCID, channel, APID)
  - PTP is configured before each pass to determine where to send user data over ground network
  - Spacecraft cannot dynamically address data to various ground systems or to other spacecraft
- SNIS supports end-to-end IP protocols with both source and destination address
  - Spacecraft identifies source of data (e.g. IP address, port number)
  - Spacecraft inserts destination address (addr/port) that can be used by the overall network to deliver data anywhere
  - Ground systems use standard IP routing mechanisms to automatically forward packets to their destination (e.g. control centers, PIs, or other spacecraft)
  - Spacecraft can dynamically address data anywhere
  - Ground data routing is fully data driven

Science Alert

- One spacecraft detects alert and wants to send notification to many other ground/space systems across an IP network
  - Gamma Ray burst
- SNIS connects space elements and ground networks into one addressable network
- Spacecraft addresses alert packet to one or more addresses
- Packet relays through TDRSS to WSC
- Address causes router at WSC to send alert packets to one or more network nodes



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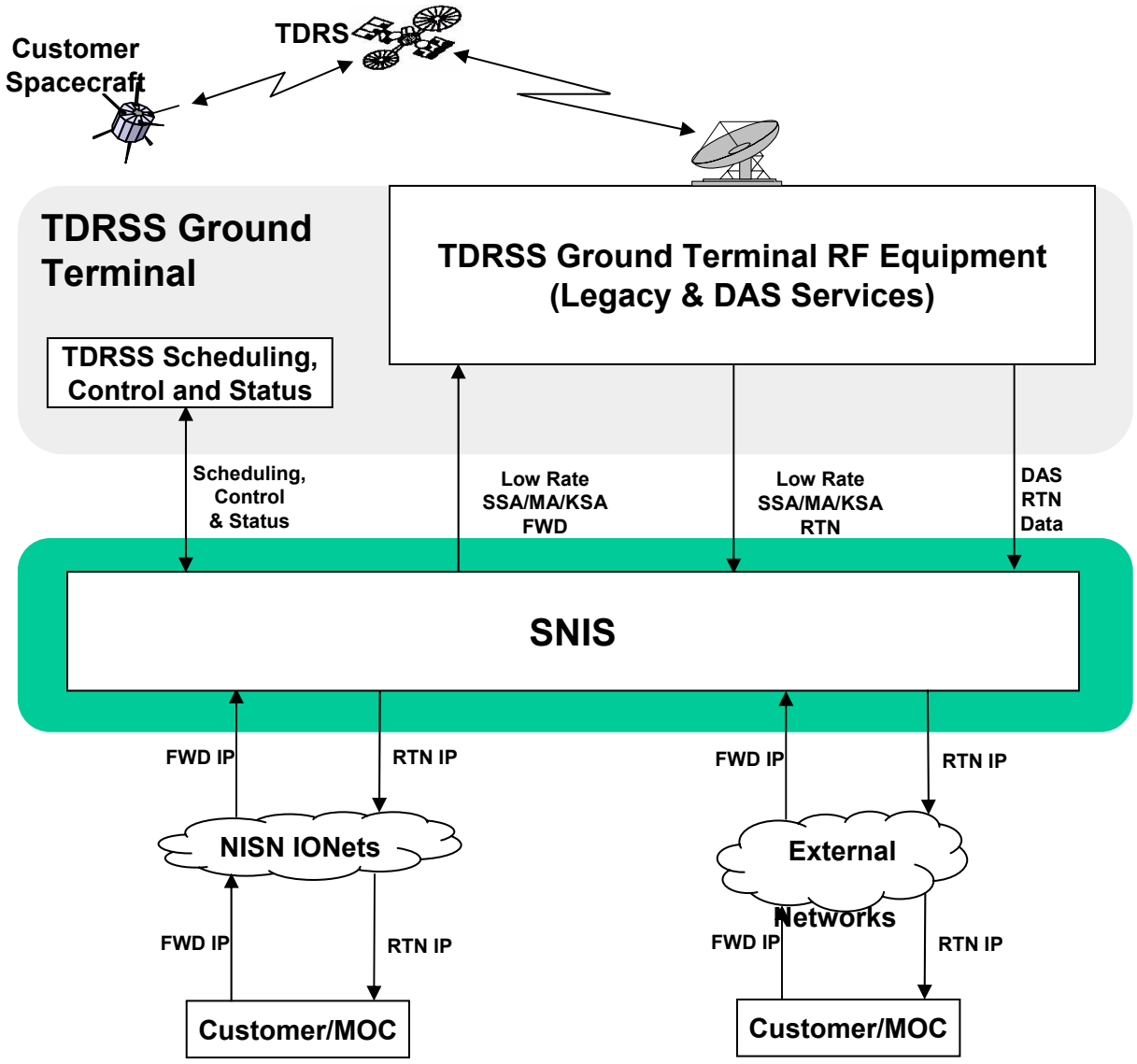
High-level SNIS Functional Architecture



SNIS Status

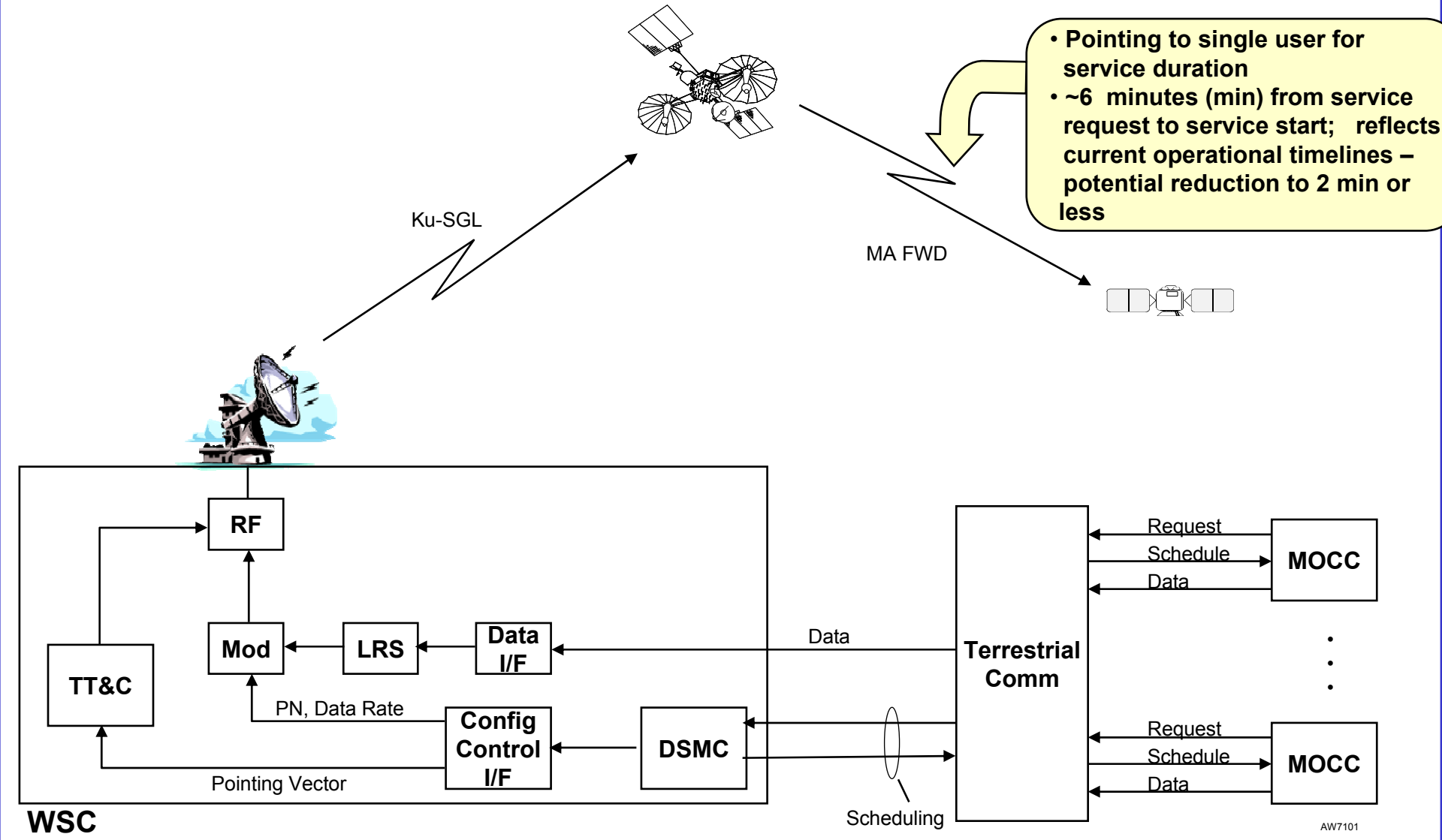
- Systems requirements, preliminary architecture, and ops concepts currently under development
- Next Milestone: System Requirements Review (SRR) October 2004
- Target Operational Date: March 2007

Multiple Access Fast Forward Service

Background

- SN provides a high capacity, 24 x 7 Return Link Demand Access Service (DAS) via the Multiple Access (MA) service; ideal for
  - Science alerts (e.g., for SWIFT, GLAST)
  - Emergency 911
  - General elimination of need for operator-intensive service scheduling
- Complementary, near-Demand Access Forward Link capability -- termed Fast Forward -- may also be of user interest
  - Eliminates long-lead scheduling, reduces operational overhead
  - Enables efficient, rapid utilization of unused MA FWD time -- e.g., access within minutes, without operator-intensive interface via SWSI/SNAS
  - Efficient Forward Link usage, as needed -- e.g., ACK/NAK for RTN Link DAS scenarios, such as 911 and science alerts
  - Emerging Sensor Web applications
- Near-term, Fast Forward capability potential via existing SN
- TDRSS-Continuation (TDRSS-C) addressing options for a more optimized a FWD DAS capability, tailored more precisely to future user needs

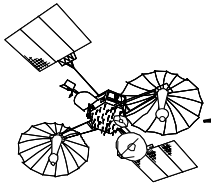
Current MA FWD Architecture



FF Packet Mode Operations

- FF users operate in packet mode
  - Avoids situation wherein single user “captures” FWD link for extended period
  - Specific packet duration to be established, as part of design trades
  - Illustrative packet scenario:
    - 20 sec packet
    - Up to 5 seconds for synchronization
    - 15 seconds of data ⇨ > 3500 bits @ 250 bps
- FF operations should ensure MA FWD EIRP approximately equal to current EIRP ~ 34 dBW
  - Consistent with FWD data rate ~ 125 - 500 bps

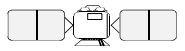
FF Candidate Architecture #1: Rapid, Near-Real-Time Scheduling



Beam Pointing
- Dedicated to one customer at a time

Ku-SGL

MA FWD



Operations Concept

1. All user data + ID enters FWS in real-time
2. User data packetized (e.g., 20-30 sec/packet)
3. User data queued on first-come-first-serve basis
4. Minimum delay between MA FWD services ranges from 20 secs to 6 min (depending on degree of upgrade feasible)

RF

Data

FF Workstation (FWS)

Mod

LRS

TT&C

USS

PN, Data Rate

•Database
•Data Queue
•Control

TT&C ADPE

Pointing Vector

•Data
•Database Updates

Closed IoNET

•Data
•Database

MOCC

•Data
•Database

MOCC

Candidate FF Evolution Strategy

- Multi-phase Evolution
  - IOC: FF operations via minimum impact to existing SN infrastructure
  - FOC: FF operations that "optimize" customer SN operations via cost-effective upgrades
- Initiate IOC as quickly as possible – Service Provision on Demand
  - Suitable for "lightly-loaded" MA FWD *(i.e., current operations)*
- During Evolution of IOC, conduct FOC trade studies/ analysis/ simulations that address (for example):
  - Impact of increasing FF population
  - Potential bypass of DSMC
  - SN ground station impacts
  - Customer impacts (MOCC, spacecraft)
  - Latency minimization
  - Grades of service
  - Integrated FWD/RTN DAS operations and potential benefits/impacts
- IOC, FOC target dates, (TBD)

For More Information

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Fast Forward Product Design Lead
Andre.Fortin@nasa.gov
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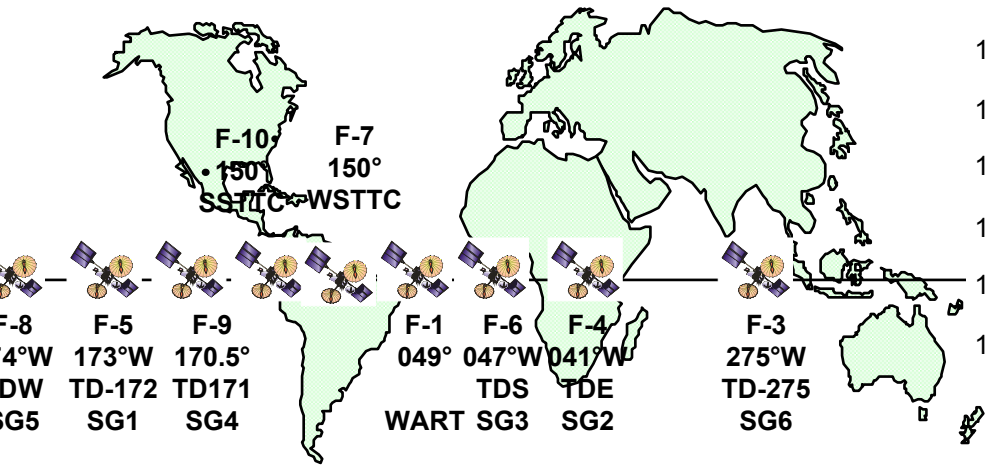
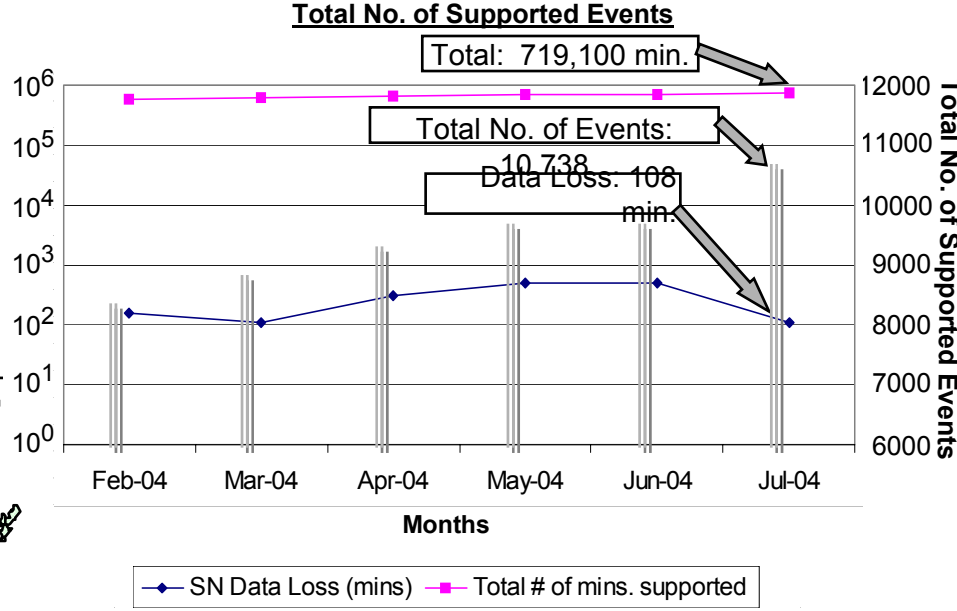
Space Network
Code 452

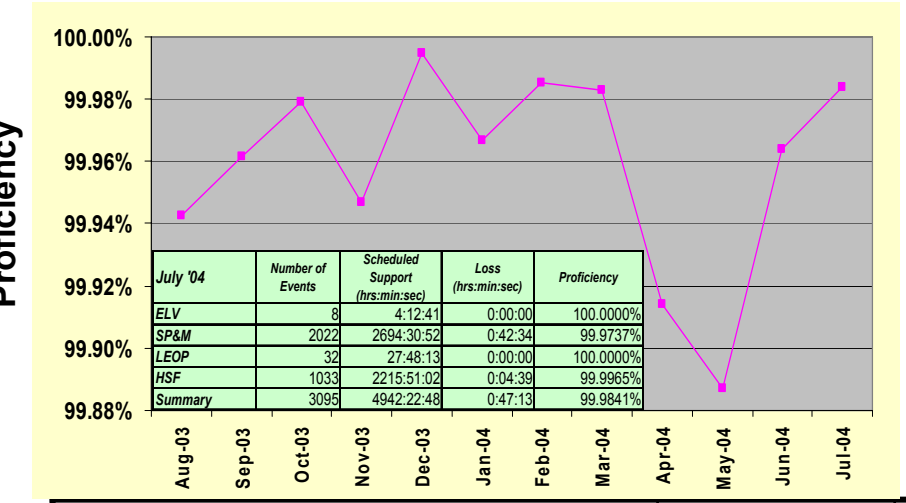
Project Manager:	Keiji Tasaki
Deputy Project Manager:	Thomas Gitlin
Mission Business Manager:	Paula Tidwell
Prime Contractor:	Honeywell Technology Solutions, Inc. (HTSI)

- **Space Network at a Glance**



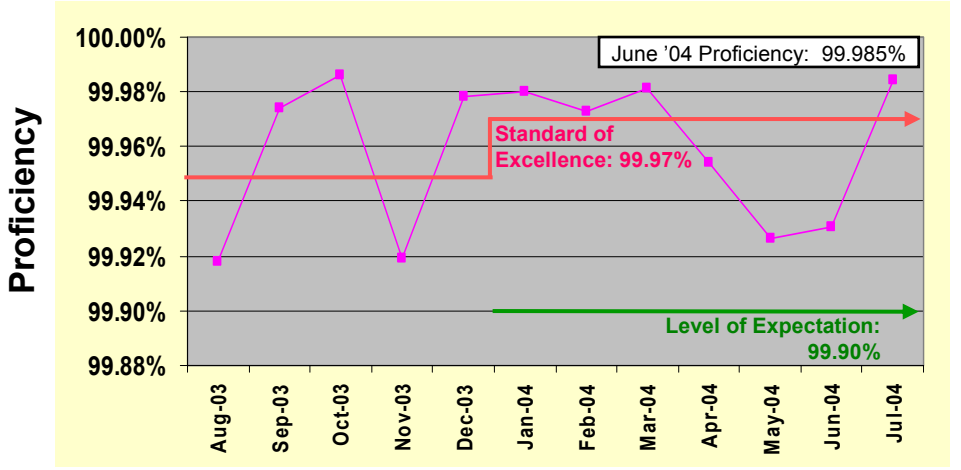


SN Critical Support Proficiency Trend



July '04	Number of Events	Scheduled Support (hrs:min:sec)	Loss (hrs:min:sec)	Proficiency
ELV	8	4:12:41	0:00:00	100.0000%
SP&M	2022	2694:30:52	0:42:34	99.9737%
LEOP	32	27:48:13	0:00:00	100.0000%
HSF	1033	2215:51:02	0:04:39	99.9965%
Summary	3095	4942:22:48	0:47:13	99.9841%

SN Proficiency Trend

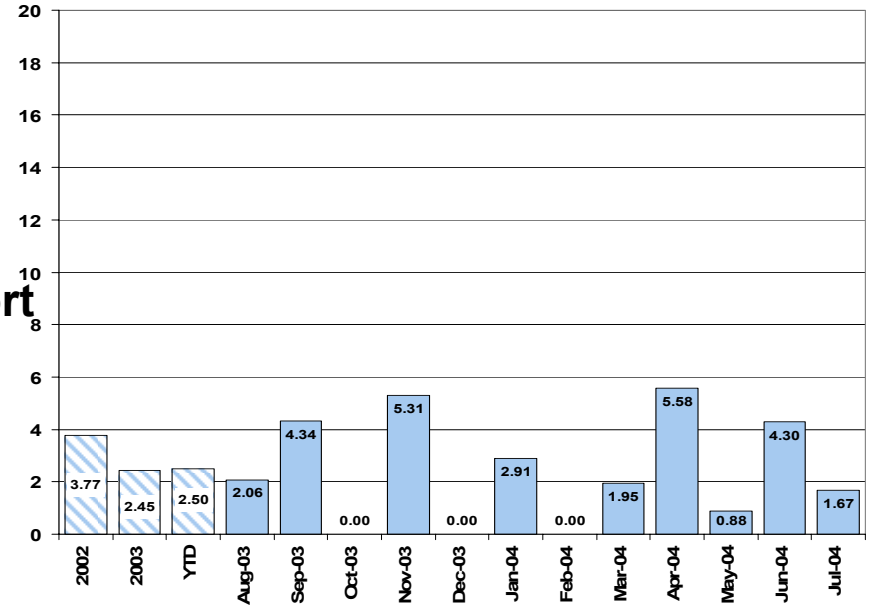


•Missions	•Total No. of Supported Events	•Service Stat.	•Proficiency (%)	•Standard of Excellence (%)
•Aqua, Aura, EO-1, ERBS, FUSE, GP-B, HST, ISS, L-7, SP&M, SPTR, TERRA, TOPEX, TRMM, UARS,XTE, P3/ASIP, P3/Delta	•10738	• 11,987 hrs. sched 11,985 hrs. actual 1 hrs. 48 min. lost	•99.984%	•99.97%

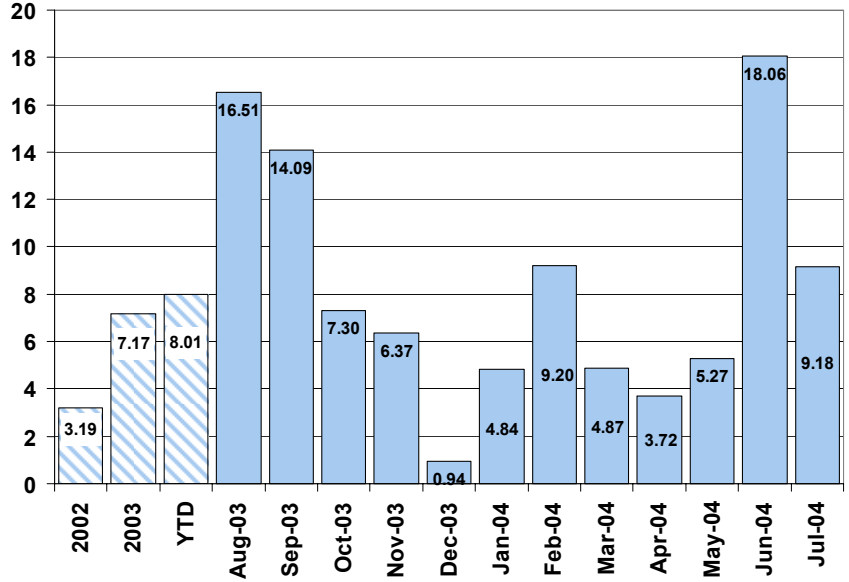
- **Space Network Error/Anomaly Trends**

  - Data loss errors only
  - Only three error/anomaly types used
    - Operator error
    - Software anomaly
    - Hardware anomaly
  - Normalized to 10,000 hours of support
  - Metrics applicable to historical data
  - The first two bars are for 2002 and 2003, respectively

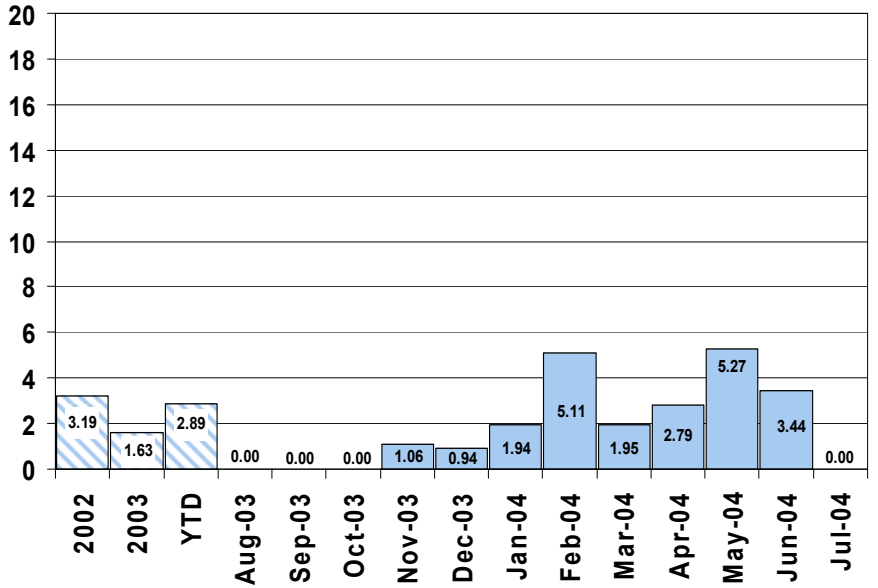
Operator Errors per 10,000 Hours of Support



Hardware Anomalies per 10,000 Hours of Support



Software Anomalies per 10,000 Hours of Support



Demand Access System (DAS)

Demand Access System (DAS) Status

- The DAS Operations Readiness Review was held on 13 May.
- Several issues were identified during the ORR. A Delta-Operations Readiness Review was successfully completed on 17 June.
- Work on the DAS continues to improve system performance and increase the ability for NENS (HTSI) to quickly identify and resolve problems.

TDRS KSAR Upgrade Project (TKUP)

TDRS KSAR Upgrade Project (TKUP)

Introduction

- GSFC/Code 450, Code 452 and NASA Headquarters management met on March 1, 2004 to reassess the Ka-Band Data Services (KaDS) Project and the Ka-Band Flight Systems (KaFS) Project
- Both the KaDS and KaFS projects were discontinued
- Direction was given to formulate and present to management for approval a new project providing a data service for the 225 MHz channels using bandwidth efficient modulation and coding schemes
- Direction was also given to explore potential synergy with replacement of the existing 225 MHz channel data service equipment due to obsolescence
- TKUP was proposed to management and approved in July 2004.

Current SN Situation

- Maximum coded KSA Return data rate is 150 Mbps
- Maximum uncoded KSA Return data rate is 300 Mbps
  - Increases customer EIRP requirement by more than 5 dB
- The SN is not compatible with Col-T and JEM
  - ISS desires to use these Ka-Band systems as backup in case of a Ku-Band antenna system failure
- Large expenditures will be required in the future for SN equipment obsolescence avoidance
  - KSA High Rate (Loral) Equipment and High Rate Switches (Harris)
    - Projecting impacts to operations beginning ~2008 due to equipment failure and inability to repair
  - Cost of addressing obsolescence is dependent upon the approach
  - Original Loral Costs: $32.4M (6/92 estimate, no software costs)
  - Original Harris Costs: $7.2M (6/92 estimate, no software costs)

TKUP Top-Level Requirements

- Enhance the TDRSS KSA 225 MHz Return data service by adding the capability to process bandwidth efficient signal designs
  - Potential requirements (per recent modulation and coding study)
    - OQPSK/TPC or LDPC - 150 Mbps to 410 Mbps
    - 8PSK/TPC or LDPC - 410 Mbps to 625 Mbps
- Provide Single Access Antenna Autotrack for new signal designs
- Enhance the KSAR service by adding the capability to process Col-T and JEM signal designs
  - QPSK modulation (SN currently supports OQPSK)
  - No stacking of convolutional encoder/decoders
- Replace Equipment nearing obsolescence
  - KSAR High Rate Equipment and High Rate Switches
- Potentially provide one-way and/or two-way Doppler tracking for new signal designs
  - Need to develop the operations concept to establish requirement

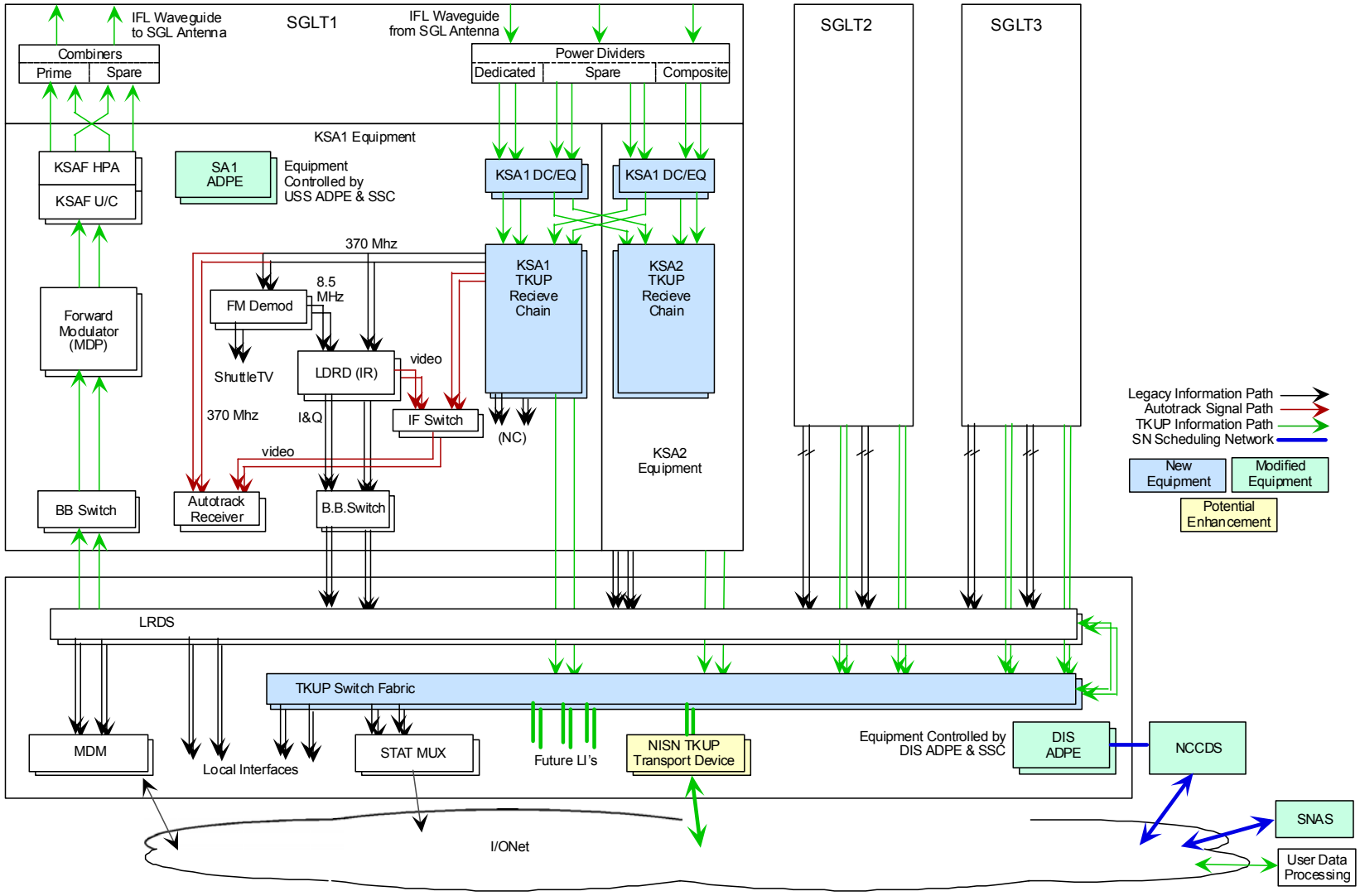
Items Not Proposed for TKUP

- 16QAM/TPC or LDPC - 625 Mbps to 825 Mbps
  - New signal designs without 16 QAM have lower technical risk
  - Existing EET HPAs adequate for new signal designs without 16 QAM
- Ka-band end-to-end test capability
  - No Ka-Band customers on the horizon
  - Adds significant cost

Follow-on Needs (Not Part of TKUP)

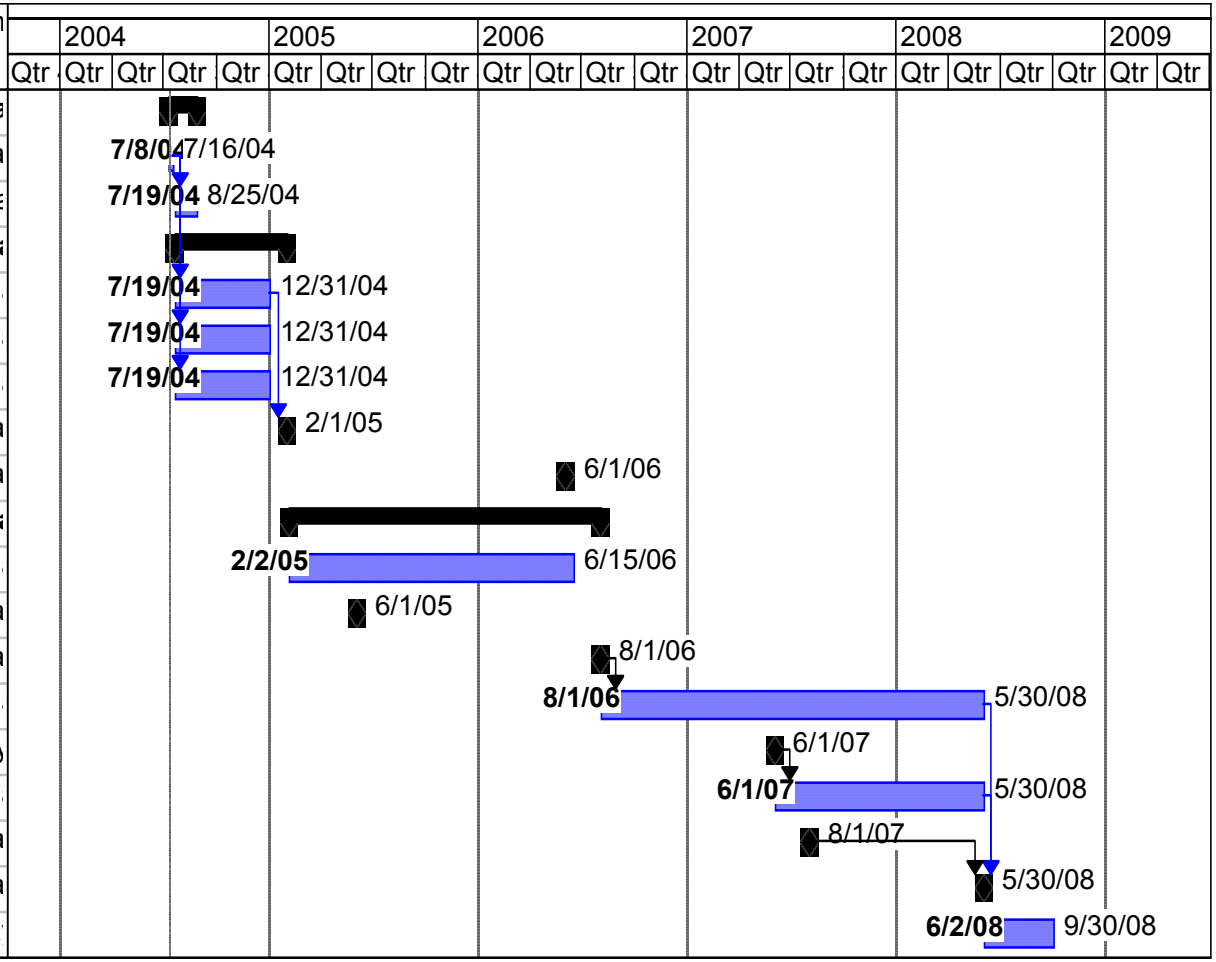
- Follow-on Items will be worked with new customers as they are identified
  - Compatibility Testing
    - Potential approaches include
      - Test via TDRS using rooftop antenna at vendor site
      - Test using spare receiver in the CTV
      - Provide a full equipment suite for the CTV
  - Flight Hardware
    - Potential area of partnering with customers
  - Data Interfaces
    - NISN or Local Interface

Proposed TKUP Architecture



Proposed TKUP Schedule

ID	Task Name	Duration
1	**Project Formulaion**	**35 da**
2	Obtain Management Approv	7 da
3	Develop PCD and PMP, Tas	28 da
4	**Requirements Development**	**141 da**
5	Develop Architecture	120 d
6	Develop Operations Concep	120 d
7	Develop System Requiremer	120 d
8	System Requirements Revie	0 da
9	Demonstration	0 da
10	**Design**	**389 da**
11	System Design	357 d
12	Preliminary Design Review	0 da
13	Critical Design Review	0 da
14	Implementation	479 d
15	First article reciever on s	0 day
16	Test	261 d
17	Documentation and Training Cc	0 da
18	Operations Readiness Review	0 da
19	Unplanned work (contingency)	87 da



Bilateration Ranging Transponder System (BRTS) Augmentation

BRTS Augmentation

Background

- BRTS is critical in providing SN customers with extremely accurate tracking services
- The BRTS system is over 20 years old
- Some BRTS subsystems have no spare parts
- Some critical subsystems are not repairable
- Loss of BRTS stations will degrade or prevent SN from meeting customer tracking requirements

BRTS Augmentation

- Requirements review conducted on 3/3/04
- All RFAs closed
- QSS analysis task in progress

BRTS Augmentation Schedule

- System Requirements Review March 3, 2004
- QSS Study Task Began June 28, 2004
- NENS Task Start 11/04
- Preliminary Design Review 1/05
- Critical Design Review 4/05
- System Delivery 10/05
- Test Readiness Review 12/05
- I & T Complete 3/06
- Operations Readiness Review 3/06
- Transition Readiness Review 4/06

TDRS Constellation Status/Plans

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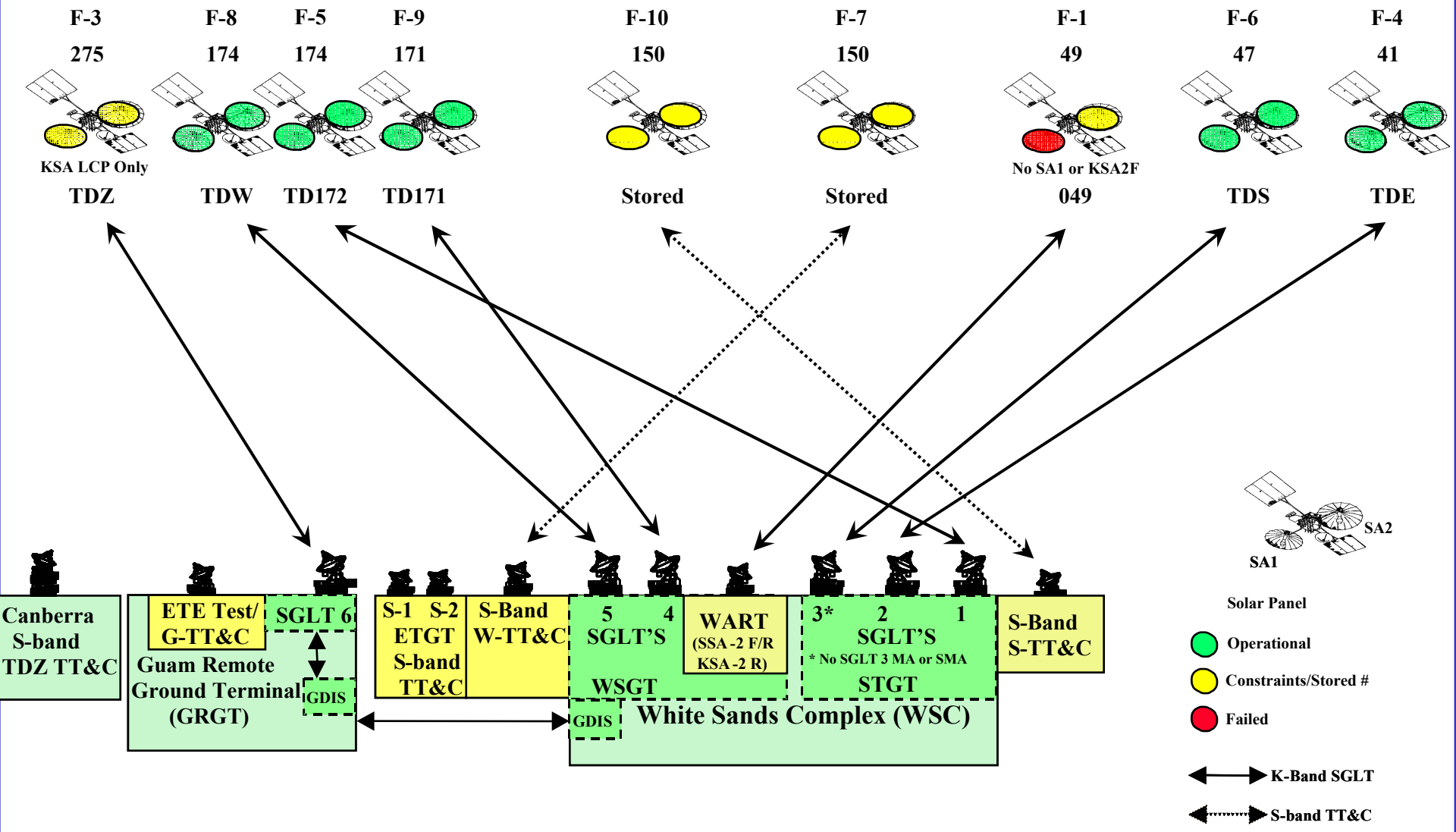


TDRS Constellation Status/Configuration - August 2004

TDRS Constellation Status and Plans - August 2004

TDRS	Inclination ↑ - Increasing ↓ - Decreasing	Current Operations Designation (Actual Orbit)	Ground Station / SGLT Assignment	Plans
1	11.59° ↑	"Residual Asset" (49.0ºW)	WSGT/WART	Retire by moving to 105ºW or boost to higher orbit.
3	7.88° ↑	TDZ (275.25ºW)	GRGT/SGLT-6	Replace TDRS-1 at 49ºW after TDRS-7 is moved to 275ºW.
4	5.93° ↑	TDE (41.0ºW)	STGT/SGLT-2	*Move to 46ºW.*
5	5.13° ↑	TDW (173.6ºW)	STGT/SGLT-1	*Move to 171ºW* to complete KSAR, SSAF & SSAR payload investigation.
6	4.39° ↑	TDS (47.0ºW)	WSGT/SGLT-3	*Move to 174ºW.*
7	6.58° ↑	Stored (150.5ºW)	WSGT STTC	Replace TDRS-3 at 275ºW after ground antenna becomes available.
8	3.95° ↓	174 (174.3ºW)	WSGT/SGLT-5	Move to 62ºW and store after TDRS-6 move.
9	7.24° ↓	171 (170.7ºW)	WSGT/SGLT-4	Operate through Sep 2004, then *Move to 79ºW*.
10	6.01° ↓	Stored (Drifting)	STGT STTC	*Moving to 41ºW*. Begin customer operations co-located with TDRS-4 Jan 2005.

Green italic underlined text denotes current/near term events

Second Guam Antenna System (SGAS)

Andre Fortin
SGAS PDL
SN Project/Code 452
NASA/Goddard Space Flight Center

Second Guam Antenna System (SGAS)

- Supertyphoon Pongsona hit Guam on December 8, 2002. The storm packed sustained 150 mph winds with gusts in excess of 180 mph. Although there was minor damage to the GRGT (mostly to the roof), efforts were taken to identify and mitigate several vulnerabilities of the station.
  - One such vulnerability identified was the lack of a backup space-to-ground link antenna system.
- Requirements definition and system design is complete. The project is now in the procurement phase.
- Facility design is 50% complete.

Second Guam Antenna System (SGAS)

- Recent design changes include:
  - Accommodating space for another future SGL antenna.
  - Increasing SGL antenna size to 15 meters (originally 11-meters) for future growth/higher data rate customers
- Schedule
  - Phase 1 Facilities Design Review (100%) Week of Aug 23rd
  - Phase 2 Facilities Design Review (100%) Sept 27, 2004
  - Phase 1 mods complete Dec 2004
  - Phase 2 mods complete April 2005
  - Installation begins March 2005
  - ORR Oct 2005

SGAS Antenna Plan

Space Network Access System (SNAS)

Caren Gioannini
Code 452/566
NASA/Goddard Space Flight Center

SNAS Purpose

- SNAS is intended to be capable of supporting all SN customers by providing a network-based system incorporating features from the User Planning System (UPS), the SN Web Services Interface (SWSI) and other SN customer-required functionality.
- Motivation:
  - The SN requires a fully capable, low cost, easily integrated SN scheduling and service control and status interface.
  - The sustainability (hardware and software) of the UPS for the life of the SN is questionable, therefore a transition to a more modern system makes sense.

SNAS Status

- SNAS implementation is currently on hold pending the appointment of a Product Design Lead.
- A task was initiated with the NENS contractor to assess SNAS until the development process begins (pending PDL assignment).
  - The following activities have been completed:
    - Developed Customer liaison plan to coordinate SNAS activities with the customer community and publicize SNAS with a goal of achieving “buy-in” by customers.
    - Re-evaluated SNAS Systems Requirements Review (SRR) Requests for Actions (RFAs); modified responses will be formally re-submitted to RFA originator.
    - Met with RFA authors and SN Customers to identify concerns/issues.
    - Wrote white paper to address architecture advantages/disadvantages.
    - Re-evaluated planned implementation approach and schedule.

SNAS Status (cont'd)

- The following activities are on-going or to be performed:
  - Developing changes to the SNAS requirements and operations concept documents based on RFA responses and discussions with customers.
  - Evaluating the Electronic User's ICD for SNAS implementation.
  - Performing a knowledge transfer to the SNAS PDL (when assigned).

- **Schedule**
  - The schedule for the SNAS development will be determined after the SNAS PDL is assigned.
  - Plans are to conduct a Delta-SRR.

Guam DS3

Caren Gioannini
Code 452/566
NASA/Goddard Space Flight Center

Guam DS3

- Purpose
  - Increase the bandwidth available SN Customer support through GRGT.
  - Upgrade the current 3-T1 circuit configuration (aggregate of ~4.6 Mbps) to a DS3 circuit (~45 Mbps).
- Status
  - Both DS3 circuits (prime and redundant) are installed and have been accepted from the carrier.
  - Carrier diverse routing off island (Guam) is in work – completion expected by 12/31/04.
  - GDIS operations is being supported on one DS3 circuit with the T1 configuration as back-up.
  - Timeplex interface required re-work; Timeplex remains on T1 circuits.

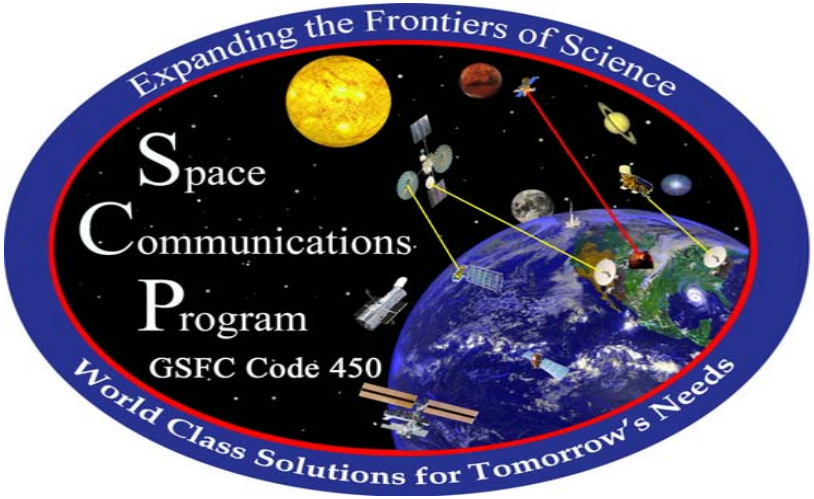
Guam DS3

- Plans
  - Complete the transition of the Timeplex to the DS3.
  - Complete the Operations checkout of the first DS3 transition (3 week period) – August 25, 2004.
  - Identify a No User time to support the transition of GDIS/Timeplex operations from the first DS3 to the second DS3. This requires equipment de-install and installation.
  - Perform an Operations checkout of the second DS3 (3 week period).
  - Notify SN community of successful transition to the DS3 configuration including how much bandwidth is available for Customer support.
  - Obtain and install bulk encryption for the DS3 circuits.
- Anticipating completion of the transition to the DS3 circuits (without bulk encryption) by mid to late October 2004.

Customer Commitment Office (CCO), Code 451

Space Communications Program (SCP), Code 450

Goddard Space Flight Center



Jon Z. Walker
Deputy Program Manager/Customer Commitment
Code 451
NASA/Goddard Space Flight Center
E-mail: Jon.Z.Walker@nasa.gov

What Services Does SCP Offer, or Coordinate?

Standard Services

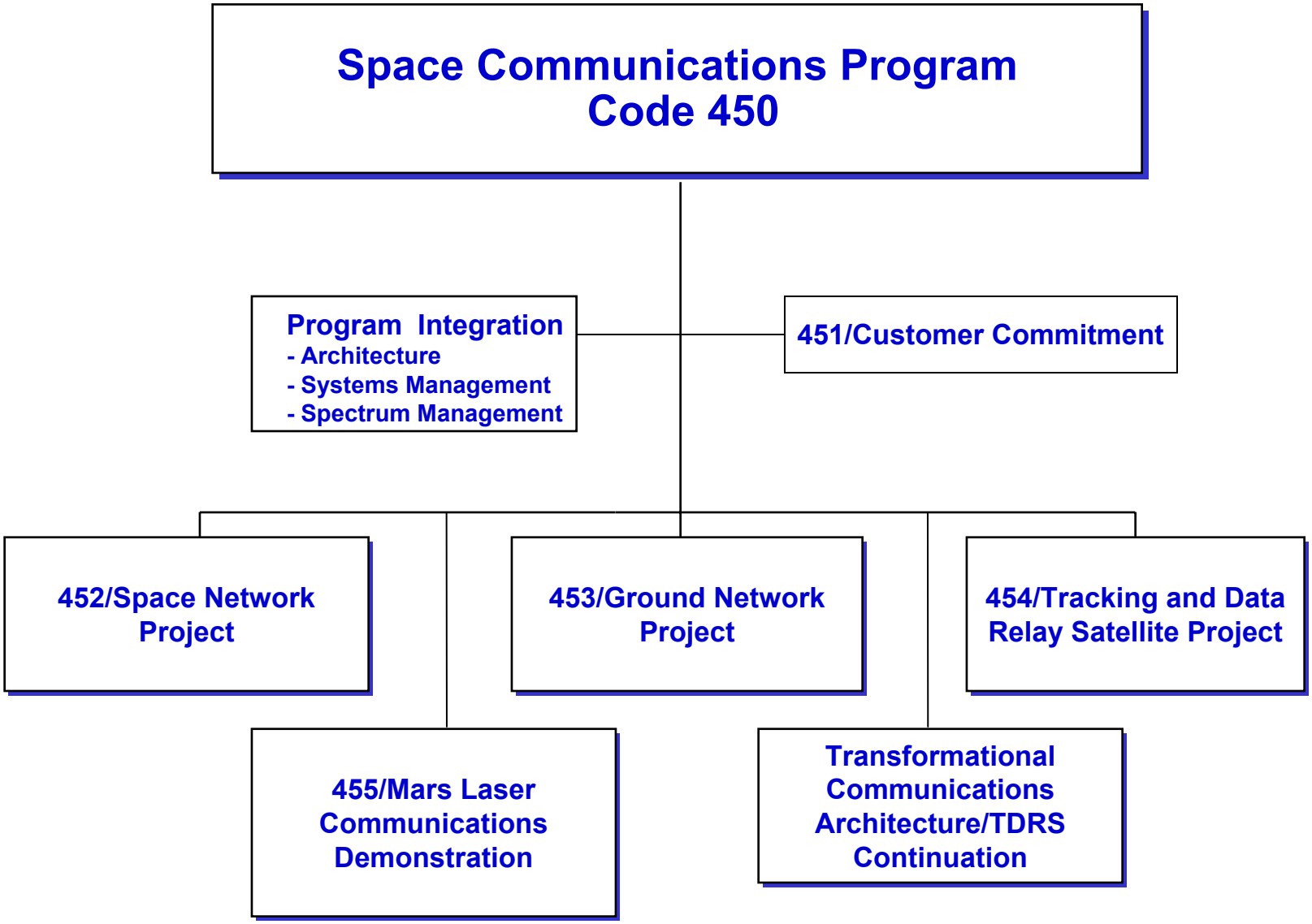
- Mission Services
  - Flight Operations
    - ➢ NENS/MOMS provides support to 428 & 444
  - Data Processing
  - Flight Dynamics
  - Simulation & Testing
- Data Services
  - Ground Network
    - » NASA & Commercial Networks
  - Space Network
  - Deep Space Network*
  - NASA Integrated Services Network*

Service Integration & Management

- RF Licensing/Consultation
- Standards Development
- End-to-end Mission Integration
  - Mission Operations Integration
  - Networks Scheduling
  - Data delivery
    - » Quality of Service levels
    - » Experience and proven performance
    - » User service metrics
- Customer-centric Approach
  - One-stop shop (Service Catalog)
    - » Standard Services
    - » Custom Services
  - Single point of contact

*Supplied by JPL and MSFC

SCP Overview



Customer Commitment Office (Code 451)

Deputy Program Manager
J. Z. Walker
Secretary
J. Burd

Business Management
M. Ambrose – Reimbursables Manager
T. Wang – Resource Analyst

Customer Support Analysis
A. Levine – Loading and Scheduling
B. Lorenz – User/RF Analysis
R. Vento (567) – User/RF Analysis

Customer Agreements
Mission Commitment Managers
L. Ambrose – Space Science Missions
J. Bangerter – Human Spaceflight Missions
E. Conwell – International/Reimbursables
C. L. Myers – Earth Science Missions
R. Schonbachler – Special Projects & Missions

Other Customer Management
P. Garza – GN Orbital Management
R. Harris – Task Order/Contracts Manager
P. McCeney – Ops Assurance Engineer
J. Martin – IMDC Team Lead
L. Phillips – IMDC Team Member

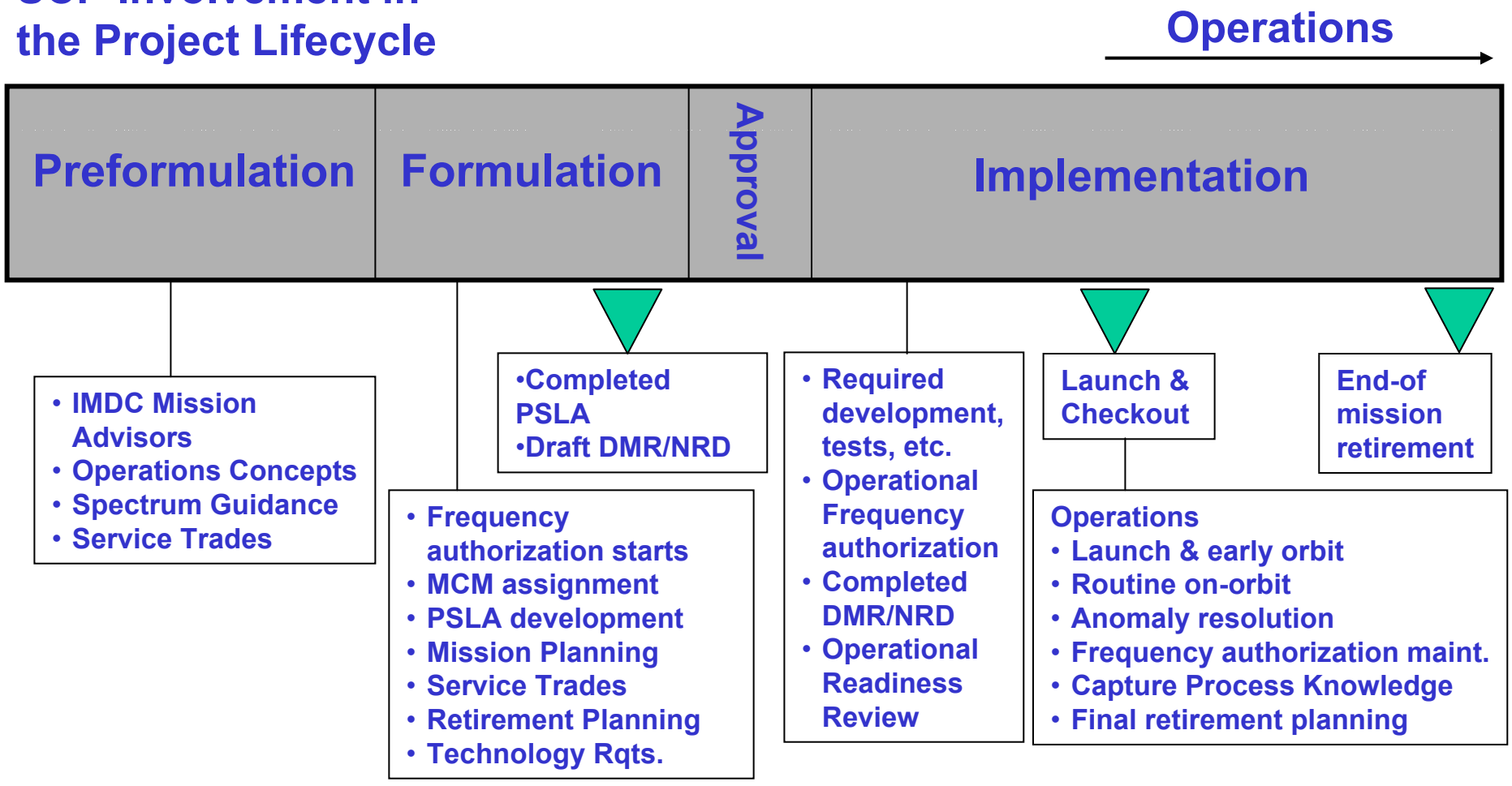
Customer Commitment Office, Code 451

SCP Support During Project Formulation

- Support to the Integrated Design Capability (was Integrated Mission Design Center) and Mission Concept Studies
- Radio Frequency Licensing (see GPG 2570.1)
- Assignment of SCP civil servants (Mission Commitment Managers) to Projects in Formulation
  - Single Point of Contact for PSLA development & space communications services
- Project Service Level Agreements (Catalog Services) & product planning (for new developments)
- Detailed Networks Requirements development
- GSFC Service Catalog, “450-Catalog-Services” on the CCMS
- Contractor support (NENS, ITT)

Customer Commitment Office, Code 451

SCP Involvement in the Project Lifecycle



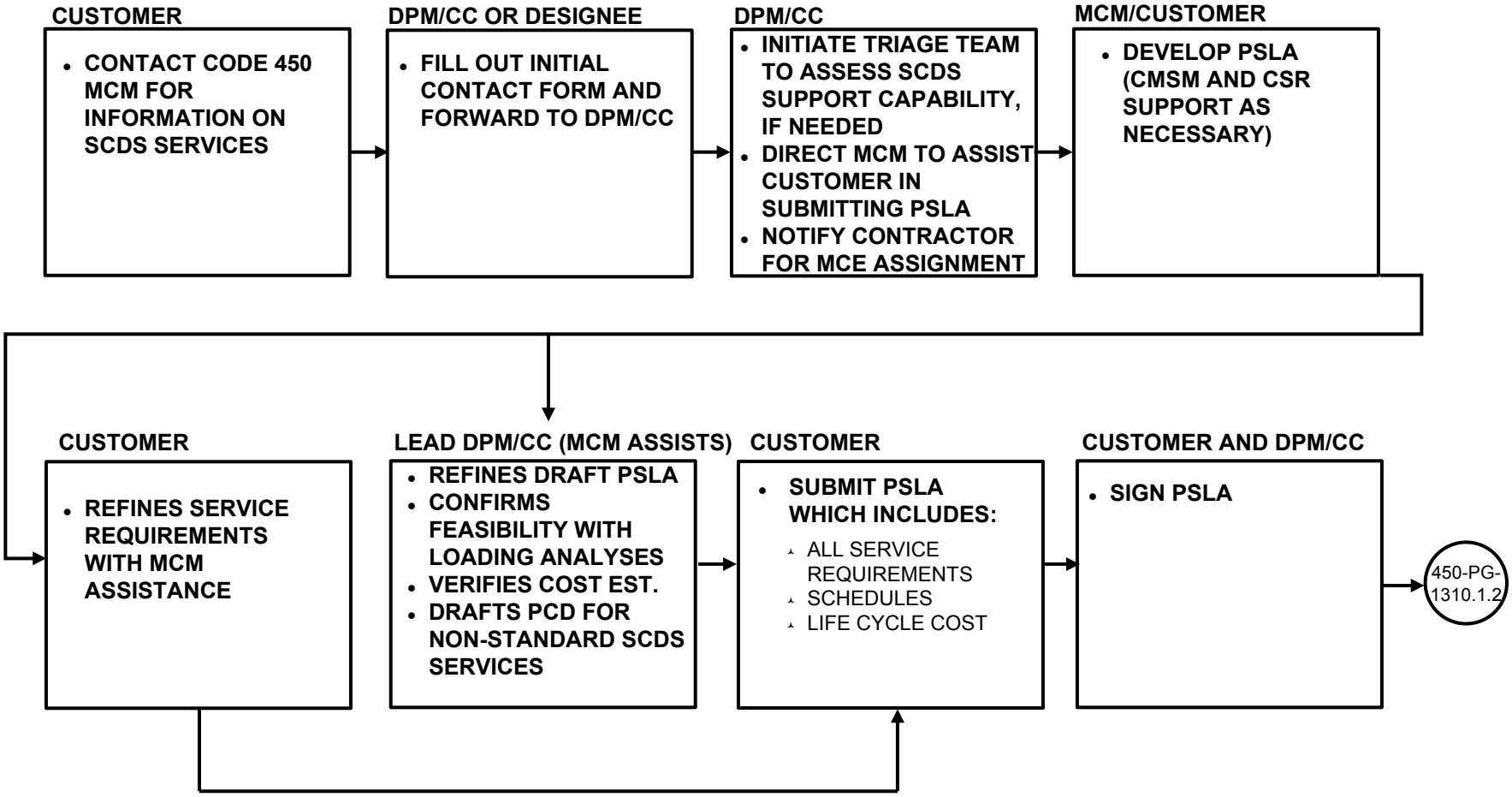
Customer Commitment Office, Code 451

MCM Quality Management Responsibilities

- The following directives have the most impact on MCMs:
  - 450-PG-1310.1.2 – Customer Commitment Process
  - 450-PG-1310.1.2 – Detailed Requirements Generation Process
  - 450-PG-1410.2.1 – Configuration Management Procedure
  - 450-PG-9090.0.1 – Non-classified Reimbursable Mission Support
- All directives are available at the Goddard Directives Management System website located at the following URL: http://gdms.gsfc.nasa.gov/gdms/pls/menu_guest

Customer Commitment Office, Code 451

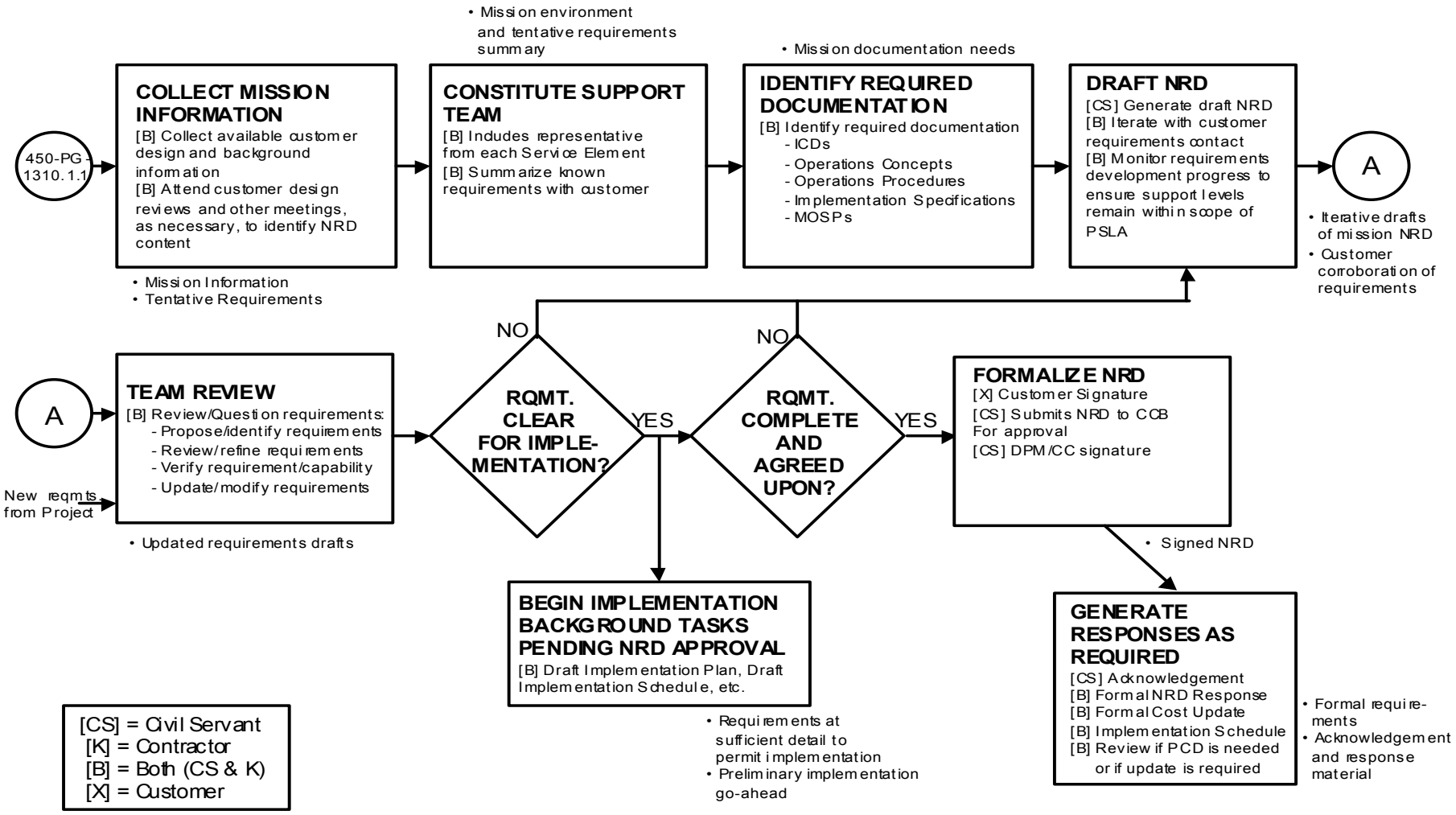
Customer Commitment Process



Space Communications Customer Forum

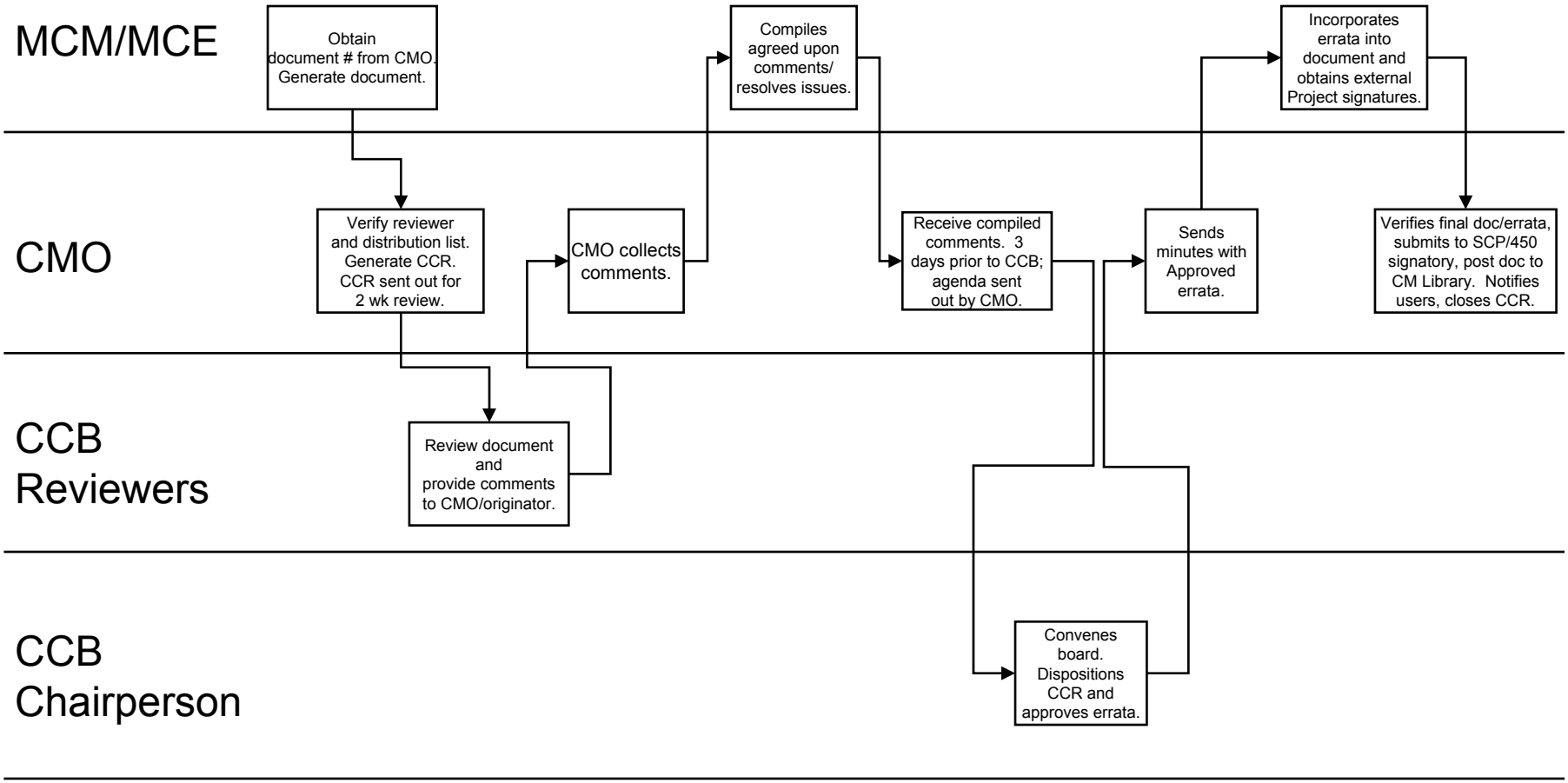
Customer Commitment Office, Code 451

Detailed Requirements Generation Process



Customer Commitment Office, Code 451

CCB Process



SUMMARY

IONET Service Classifications

Norman Reese
IP Network Operations Center
NASA Communications (Code 291)
NASA/Goddard Space Flight Center

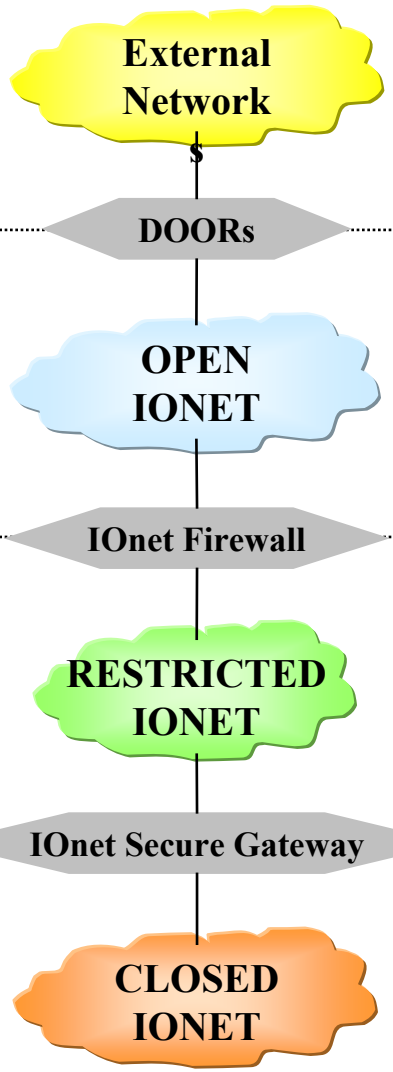
IONET Service Classifications

- IONET Service Classifications are established to meet specific Mission Operational and Security Requirements
  - Open IONET
  - Restricted IONET (New!)
  - Closed IONET
- Determining Requirements include:
  - Availability
  - External Connectivity
  - IT Security Protection
  - IT Security Response Capability

Introducing Restricted IONET

- Establish an IONET network which can support mission-critical real-time data flows for projects which have requirements for connections to other networks
  - *Closed IONET does not allow connections to external or private networks (security and operational constraints)*
  - *Open IONET was designed to support the more liberal needs of the science community, and not designed to support 24x7 mission-critical real-time data flows*
- Initial deployment supported DSN data flows for Messenger Mission
- Additional projects in consideration and will be transitioned as appropriate
  - Chandra (in testing)
  - USN (in testing)
  - New Horizons
  - Stereo A/B

IONET Networks



- NISN SIP, NISN PIP, GSFC CNE
- Internet, VBNS+, MAX, Abilene

- Mission Science Data Flows

- Control Centers w/ External Connectivity Requirements
- Gateway for DSN Tracking Stations

- SN & GN Tracking Stations
- Control Centers

Closed IONET

- Designed to support mission-critical command and telemetry data flows
- Highest possible security posture
- IONET provides complete control of external IP access to these control centers and ground stations
  - Requires significant isolation
  - Strict acceptable use policy

Restricted IONET *(New Service)*

- Supports Mission Commanding and Critical Telemetry Data Flows
- Restricted IONET provides a response capability to IT security incidents, warnings, and denial of service attacks.
- Restricted IONET projects assume significant responsibility for their IT security
- IONET DSN interface (currently on Closed IONET) will transition to Restricted IONET

Open IONET

- Designed to support mission science data flows
- High-availability available
- Connections are permitted to external networks
- Projects assume responsibility for IT Security and recovery plans
- Open nature of support reduces IT Security response capability

NISN Service Levels

Table 1. Performance Standards for IP Routed Data (by Service Category)

Service Category	Network Names	Availability (Percent)	Restoral Time	Coverage Period	Acceptable Packet Loss (Percent)	Round Trip Time
Real-time Critical	Closed IONET Restricted IONET	99.98	< 1 min	24X7	0.001	<120 ms
Mission Critical	Open IONET Closed IONET Restricted IONET	99.95	2 hr	24X7	0.001	<120 ms
Premium	PIP, EBnet	99.50	4 hr	24X7	<1.0	<100 ms
Standard	SIP	99.50	<24 hr	6 a.m. Eastern Monday to 6 p.m. Pacific, Friday	1.0	<250 ms

****Reference NISN Service Document (NSD) http://www.nisn.nasa.gov/**

NISN Interfaces for Project Requirements and Funding

Jerry Zgonc
NISN Service Manager (NSM)
Code 291
NASA/Goddard Space Flight Center

NISN Customer Interface Group
NISN Service Manager (NSM)

- Chuck Duignan, 301-286-6342
- Charles.M.Duignan@nasa.gov
- (Codes R & S) DFRC (Aeronautical), GSFC (Space Science missions) JPL, VAFB (ELVs)

- Kim Wright, 256-544-0936
- Kimberly.A.Wright@nasa.gov
- (Code M) ISS, JSC, KSC, MSFC, MAF, WSTF (Institutional)

- Seaton Norman, 301-286-8676
- Seaton.B.Norman@nasa.gov
- (Code M) STS, ISS, JSC, KSC, MAF/WSTF, MSFC, DFRC (Shuttle)

- Jerry Zgonc, 301-286-7160
- Gerald.R.Zgonc@nasa.gov
- (Code Y) LaRC, GSFC (Earth Science missions and Institutional), VAFB (EOS ELVs)

GSFC UNITeS CIG TEAM

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- MICHAEL EDER, 301,805.3076: CODE S michael.j.eder@msfc.nasa.gov
- TRISH PERROTTO, 301.805.5446 & 3106: Code Y
  perrotto_trish@bah.com

MSFC UNITeS CIG TEAM

- MICHAEL BRADLEY, PROJECT LEAD, 256.961.9492: CODE S
  michael.j.bradley@msfc.nasa.gov
- BILL MANNING, PROJECT LEAD, 256.961.9491: CODE M
  bill.manning@msfc.nasa.gov

NISN Requirements & Funding Contacts

- NISN is developing a requirements template for new project communication requirements
- Requirements template will be added to existing Project PSLA' & NRD's
- Projects can complete requirement template or request NISN assistance through the NISN Customer Interface Group(CIG)
- Project Mission requirements must be coordinated with and completed by NISN CIG
- Details of requirements as well as a Project technical and funding point-of-contact will be required
- Required funding transfers must be coordinated with NISN Business Management Group at MSFC.
  (Doralee Searcy 256-5440033/Denise Smithers 256-5445545)

deep space network

DSN Resource Allocation

Planning & Scheduling

Space Communications Customer Forum

Goddard Space Flight Cente

August 12, 2004

Gene Burke

NASA / Jet Propulsion Laboratory,
California Institute of Technology, Pasadena CA

AGENDA

- GSFC Mission Sets
- DSN Configuration
- DSN Downtimes
- RAPSO Web url: *http://rapweb.jpl.nasa.gov/*

Page 84

DSN User / Mission Planning Set

2004 - 2014

As of: August 04, 2004

ONGOING/PLANNED PROJECTS				
Project	Acronym	Launch or Start	EOPM	EOEM
Space Geodesy	SGP	--	--	--
Geotail	GTL	07/24/92	07/24/95	09/30/06
Wind	WIND	11/01/94	11/01/97	09/30/05
SOHO	SOHO	12/02/95	05/02/98	12/31/08
Polar	POLR	02/22/96	08/23/97	09/30/05
Advance Composition Explorer	ACE	08/25/97	02/01/01	09/30/10
Imager for Magnetopause-to-Aurora Global Exploration	IMAG	03/25/00	05/30/02	09/30/10
Cluster 2 - S/C #2 (Samba)	CLU2	07/16/00	02/15/03	02/28/06
Cluster 2 - S/C #3 (Rumba)	CLU3	07/16/00	02/15/03	02/28/06
Cluster 2 - S/C #1 (Salsa)	CLU1	08/09/00	02/15/03	02/28/06
Cluster 2 - S/C #4 (Tango)	CLU4	08/09/00	02/15/03	02/28/06
Wilkinson Microwave Anisotropy Probe	WMAP	06/30/01	10/01/03	09/30/08
International Gamma Ray Astrophysics Lab	INTG	10/17/02	12/18/04	12/31/08
Space Technology 5	ST5	03/01/06	05/30/06	TBD

DSN 26M LEO User / Mission Planning Set

2004 - 2014

As of: August 9, 2004

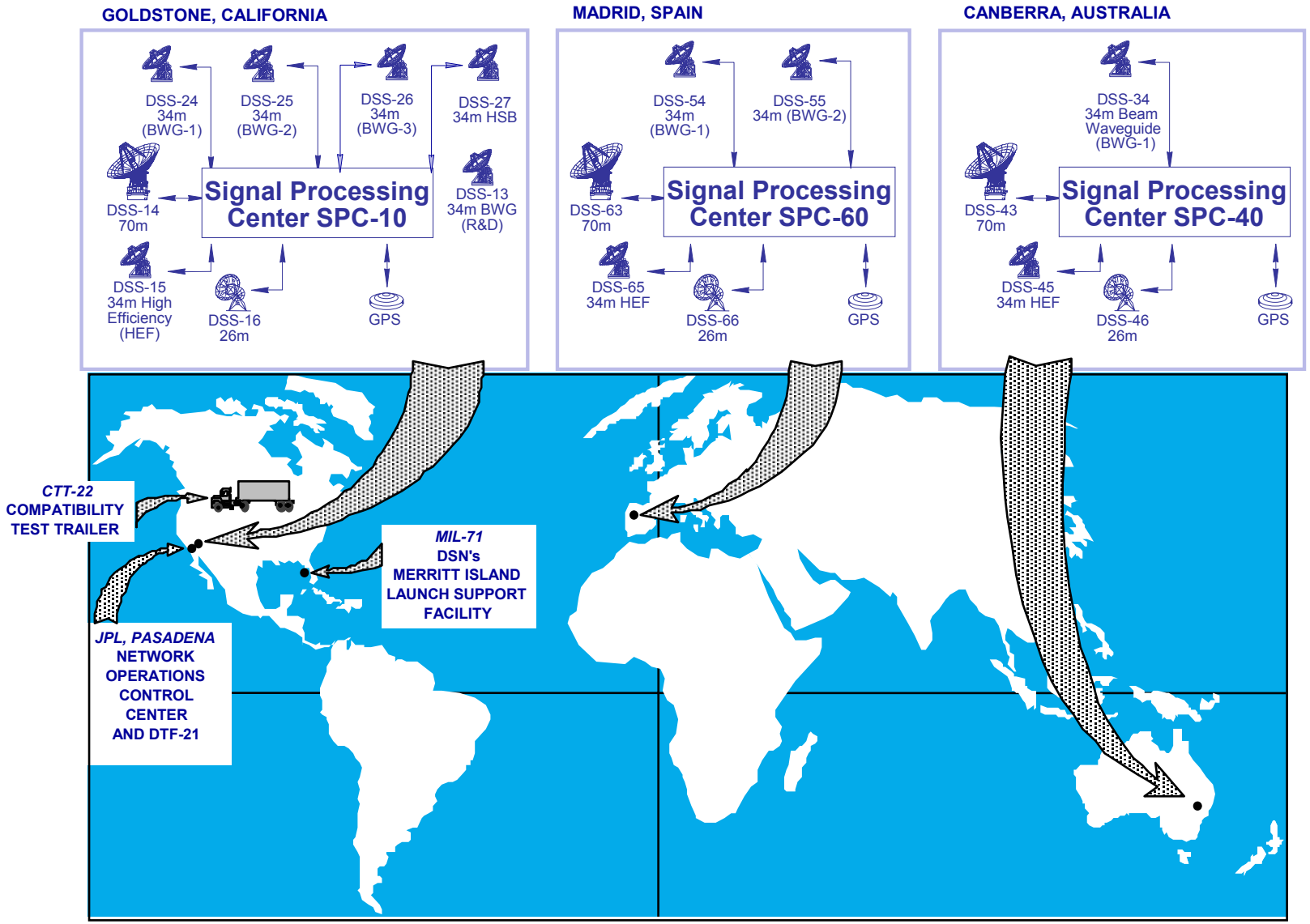
ONGOING/PLANNED PROJECTS

Project	Acronym	Support	Launch or Start	Commit End of Support	Potential End of Support
IMP-8	IMP8	Routine-V	10/26/73	09/30/06	09/30/06
TDRS-1	TDR1	E	04/04/83	09/30/01	12/31/08
LANDSAT 5	LAN5	E	03/01/84	09/30/05	
EARTH RADIATION BUDGET SAT	ERBS	E	10/05/84	09/30/98	09/30/05
TDRS-3	TDR3	E	09/29/88	09/30/01	12/31/08
TDRS-4	TDR4	E	03/13/89	09/30/01	12/31/08
HUBBLE SPACE TELESCOPE	HST	E	04/24/90	04/24/10	
TDRS-5	TDR5	E	08/02/91	08/02/01	12/31/08
UARS	UARS	E	09/12/91	09/30/05	
TDRS-6	TDR6	E	01/13/93	01/13/03	12/31/08
GOES-9	GO09	E	05/22/95	09/30/04	
TDRS-7	TDR7	E	07/13/95	12/31/08	12/31/15
RADARSAT-1	RSAT	Routine-B	11/04/95	09/30/03	09/30/08
ROSSI X-RAY TIMING EXPLORER	XTE	E	12/30/95	09/30/04	09/30/10
TOMS-EP	TEP	E	07/02/96	09/30/05	
GOES-10	GO10	E	04/25/97	05/22/03	09/30/05
TRMM	TRMM	E	11/27/97	09/30/05	09/30/06
POES-15	NO15	E	05/13/98	09/30/05	
GOES-11	GO11	E	05/03/00	05/03/05	09/30/07
TDRS-8	TDR8	E	06/30/00	09/30/10	09/30/14
POES-16	NO16	E	09/21/00	09/30/05	
GOES-12	GO12	E	07/24/01	07/24/06	09/30/08
TDRS-9	TDR9	E	03/08/02	03/08/13	03/08/17
POES-17	NO17	E	06/24/02	06/24/07	
TDRS-10	TD10	E	12/05/02	12/04/13	12/04/17
NOAA-N	NO18	LEOP/E	02/11/05	02/21/05	02/11/10
GOES-N	GO13	LEOP/E	12/01/04	12/31/09	09/30/18
GOES-O	GO14	LEOP/E	04/01/07	03/31/13	09/30/18
NOAA-N'	NO19	LEOP/E	03/01/08	03/11/08	11/01/13
GOES-P	GO15	LEOP/E	04/01/12	04/01/17	09/30/18

NOTES	
ROUTINE: Provides normal scheduled daily operations	
LEOP:	Launch and Early Orbit Operations
E or C:	Emergency or Contingency Support
B:	Back-up support
- V:	Use VHF Antenna at SPC 40

Resource Allocation Planning & Scheduling Office (RAPSO)

Deep Space Network Resources



Resource Allocation Planning & Scheduling Office (RAPSO)

LOCATION	Size	Type	I.D.
• GOLDSTONE	26m	E.O.	DSS-16 (G)
	34m	HEF	DSS-15 (Y)
	34m	BWG	DSS-24 (G)
	34m	BWG	DSS-25 (R)
	34m	BWG	DSS-26 (R)
	34m	HSBWG	DSS-27 (G)
	70m	D.S.	DSS-14 (G)
• CANBERRA	26m	E.O.	DSS-46 (G)
	34m	HEF	DSS-45 (Y)
	34m	BWG	DSS-34 (G)
	70m	D.S.	DSS-43 (G)
• MADRID	26m	E.O.	DSS-66 (G)
	34m	HEF	DSS-65 (Y)
	34m	BWG	DSS-54 (G)
	34m	BWG	DSS-55 (R)
	70m	D.S.	DSS-63 (G)

Legend

E.O.	Earth Orbiter
HEF	High Efficiency
BWG	Beam Waveguide
HSBWG	High Speed Beam Waveguide
D.S.	Deep Space

S-Band:

Green	U/L, D/L Support (G)
Yellow	D/L Support Only (Y)
Red	No Support (R)

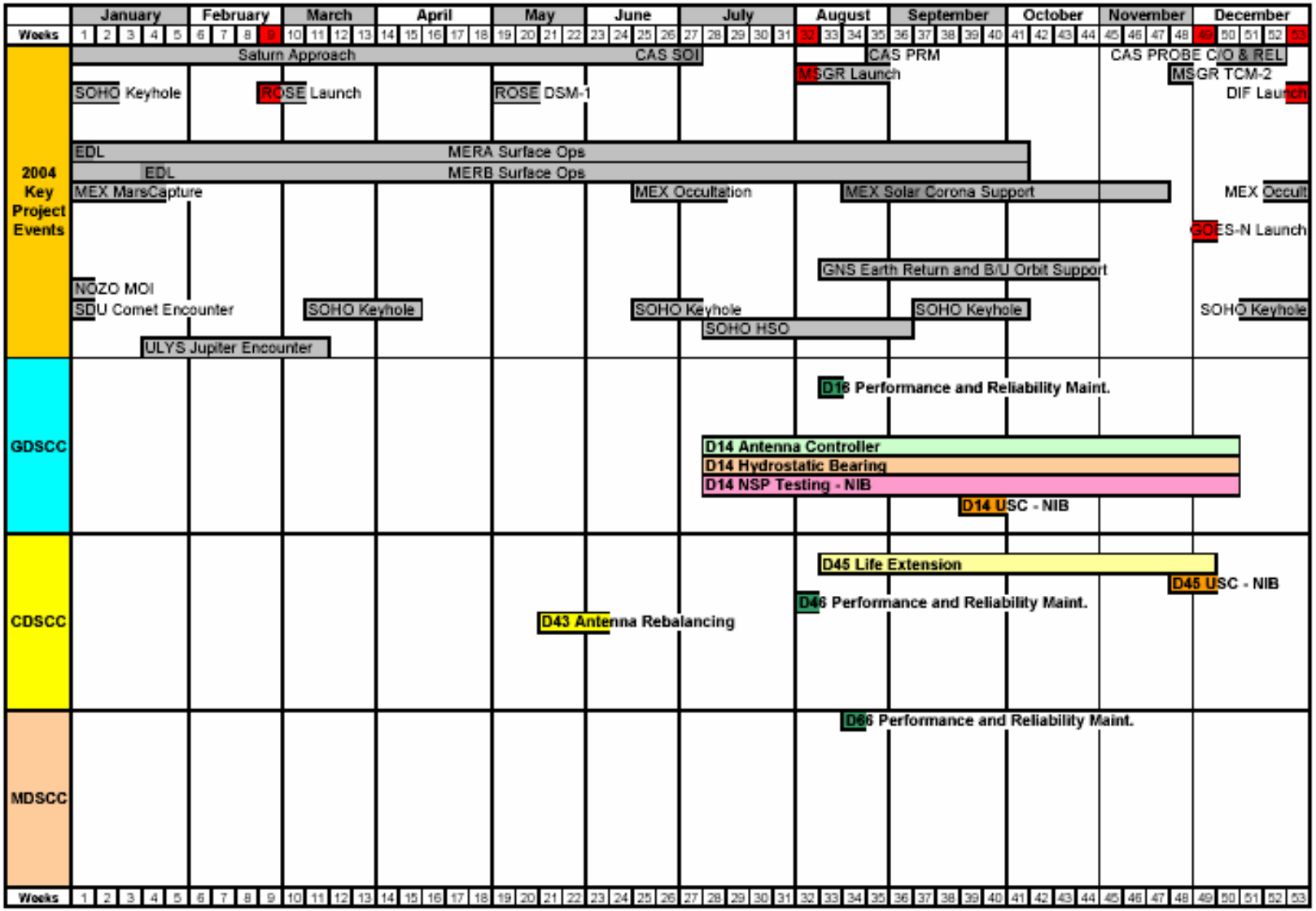
26m Subnet and DSS-27

- **26m Subnet – Obsolescence replacement tasks under consideration**
  - Hydraulic Drive (X and Y axes) – Covered by CoF Funding
  - Multi-Function Receivers – In FY'05 Plan
  - Signal and Power Cables – Not yet planned

- **DSS-27 Plan**
  - Replace legacy TT&C subsystems with NSP Uplink and Downlink subsystems
  - Equipment mostly procured in FY'04
  - Plans to complete procurement install equipment are on hold until the FY'05 budget is sorted out

Resource Allocation Planning & Scheduling Office (RAPSO)

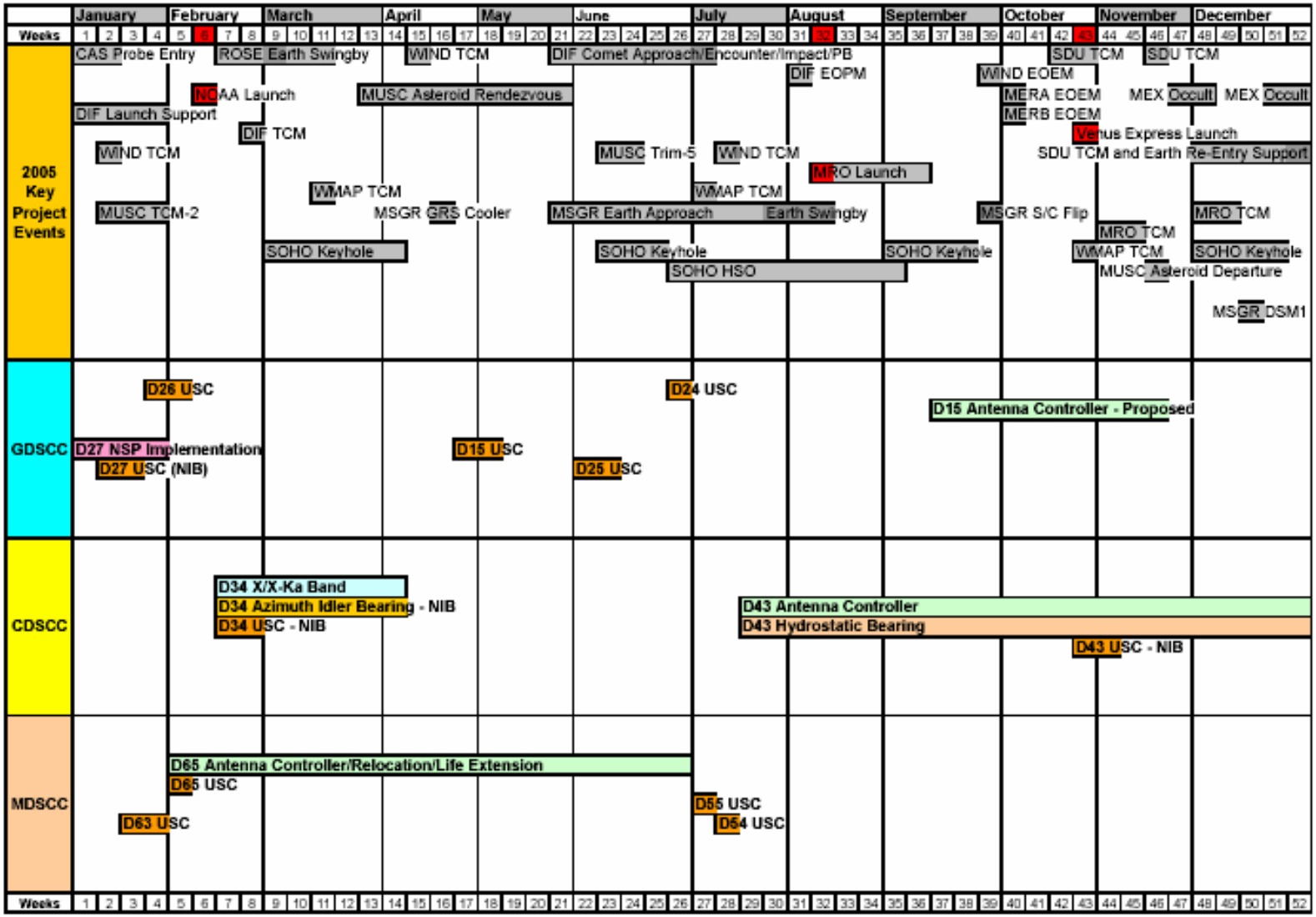
MAJOR DSN ANTENNA DOWNTIMES 2004



Revised: August 5, 2004

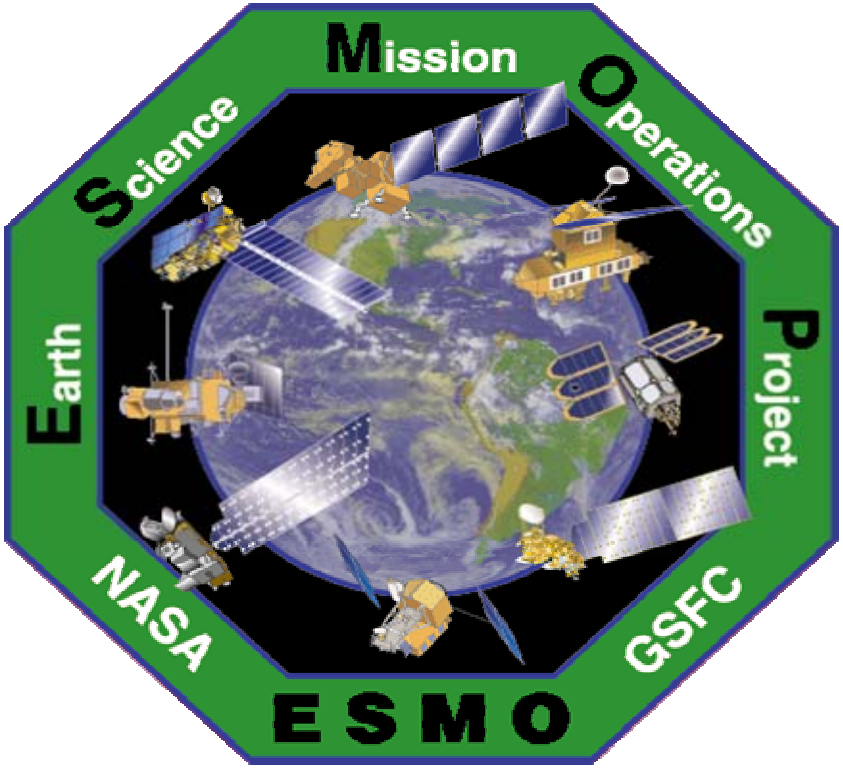
Resource Allocation Planning & Scheduling Office (RAPSO)

MAJOR DSN ANTENNA DOWNTIMES 2005



Revised: July 16, 2004

Earth Science Mission Operations



Paul Ondrus ESMO Project Manager, Code 428

Edward J. Macie ESMO Operations Director

301 614-5416

Earth Science Mission Operations Project (ESMO)

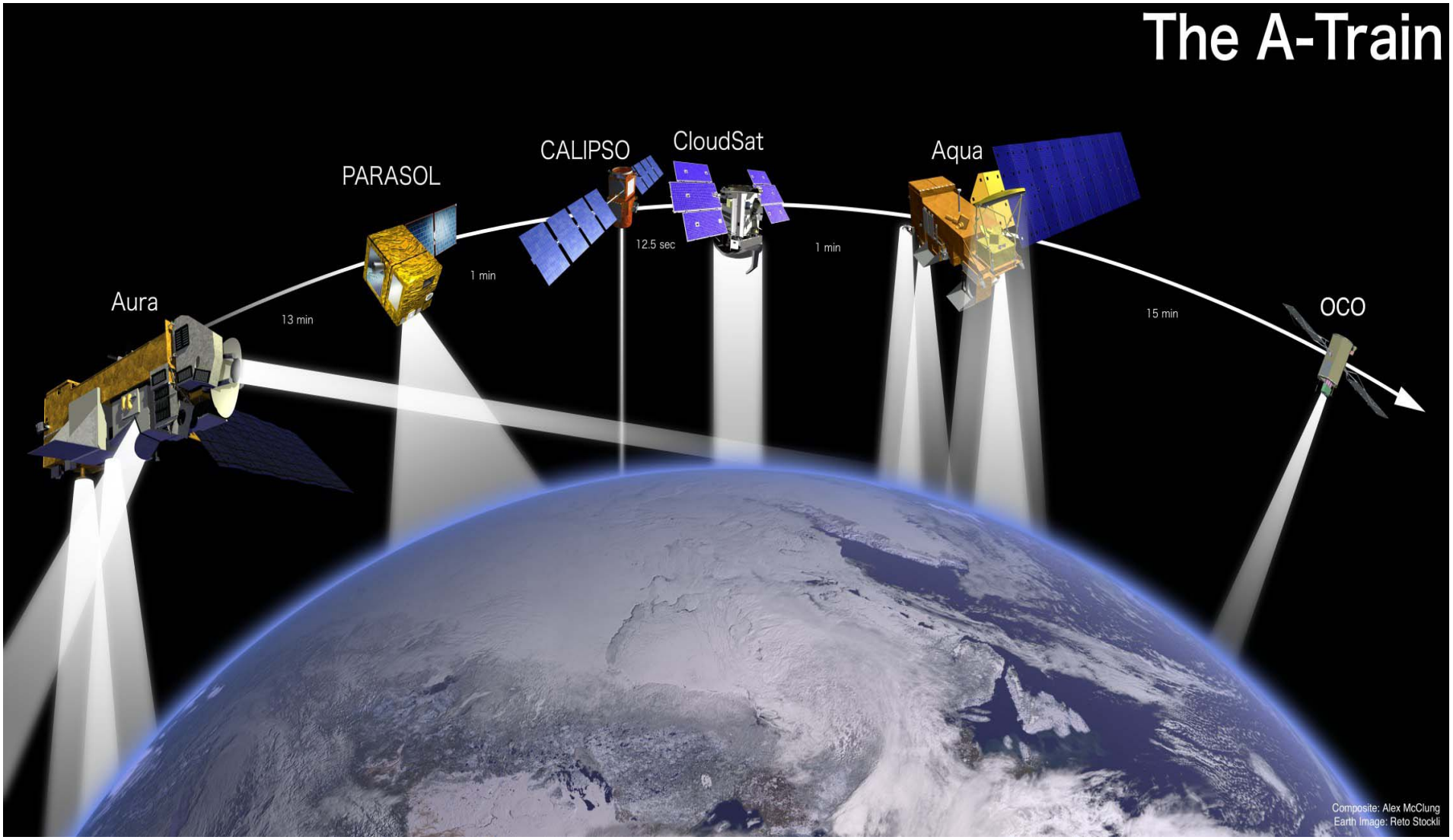
Mission Objective: The ESMO Project manages mission operations of NASA's Earth Science Enterprise satellites with a goal for each mission of successfully meeting its Level 1 requirements.

Organizations: For the Earth Science Enterprise Missions operated for GSFC, ESMO provides mission operations, data processing, and delivery of science data to science teams and/or data archives. ESMO works with the scientists, satellite and instrument developers, and Goddard technical experts to insure mission success.

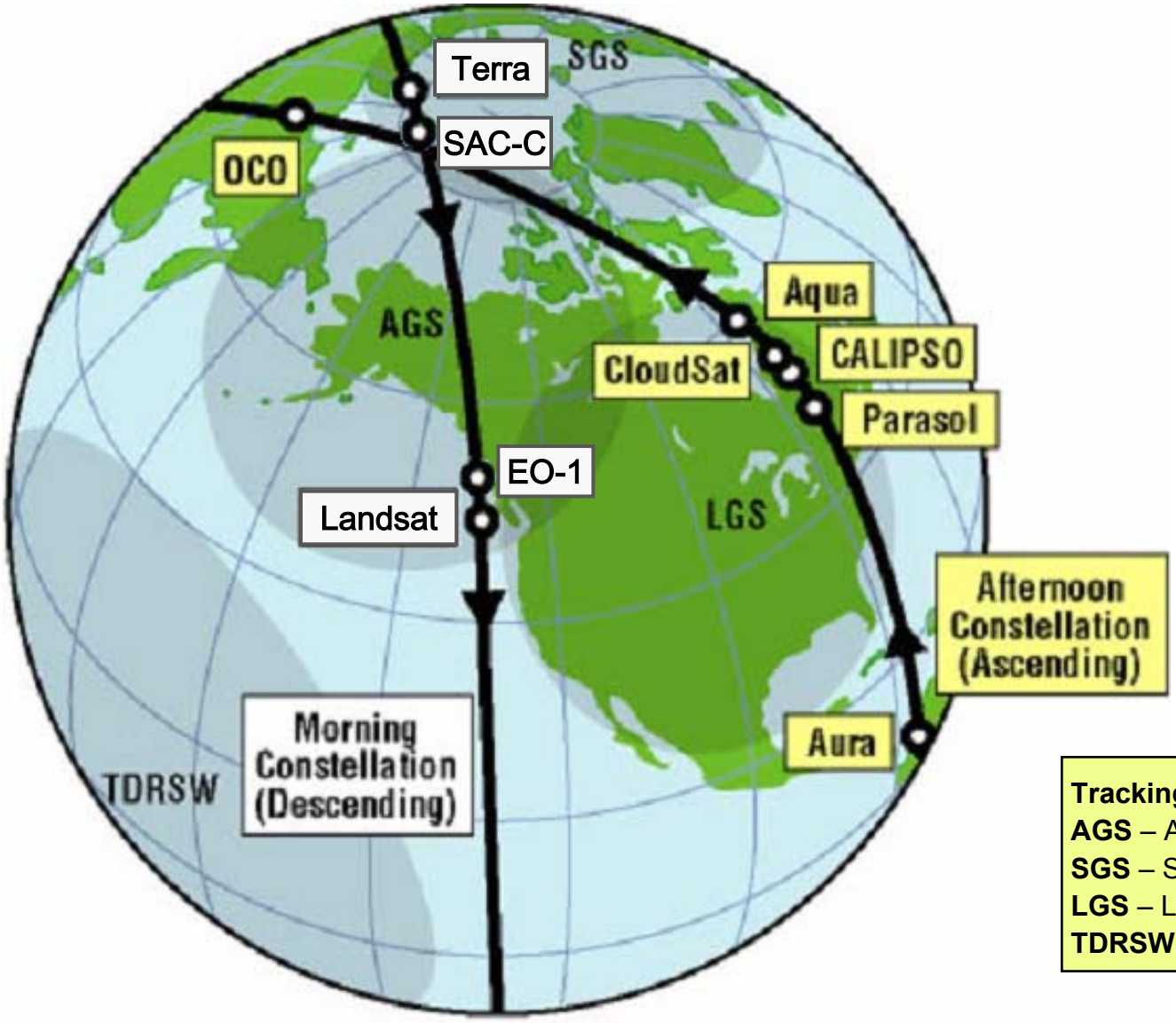
Mission Description: Satellites being operated by ESMO are Earth Radiation Budget Satellite, Terra, Aqua, Aura, Total Ozone Mapping Spectrometer Earth Probe, Tropical Rainfall Measuring Mission, ICESat, SORCE and Upper Atmosphere Research Satellite. ESMO also supports Landsat-7 anomalies and will manage operations for the Aura satellite after launch and on-orbit checkout.

Near Term Events: Aura launch successful, and on-orbit commissioning is on schedule. TRMM Reentry Planning continues, NASA HQ approved extended science operations for TRMM through January 1, 2005. We will be performing a delta-V maneuver on Thurs. Aug. 12 to put TRMM back in the 402.5+/-1.0km box. This will be the first maneuver since June 2, 2004.

Significant Progress

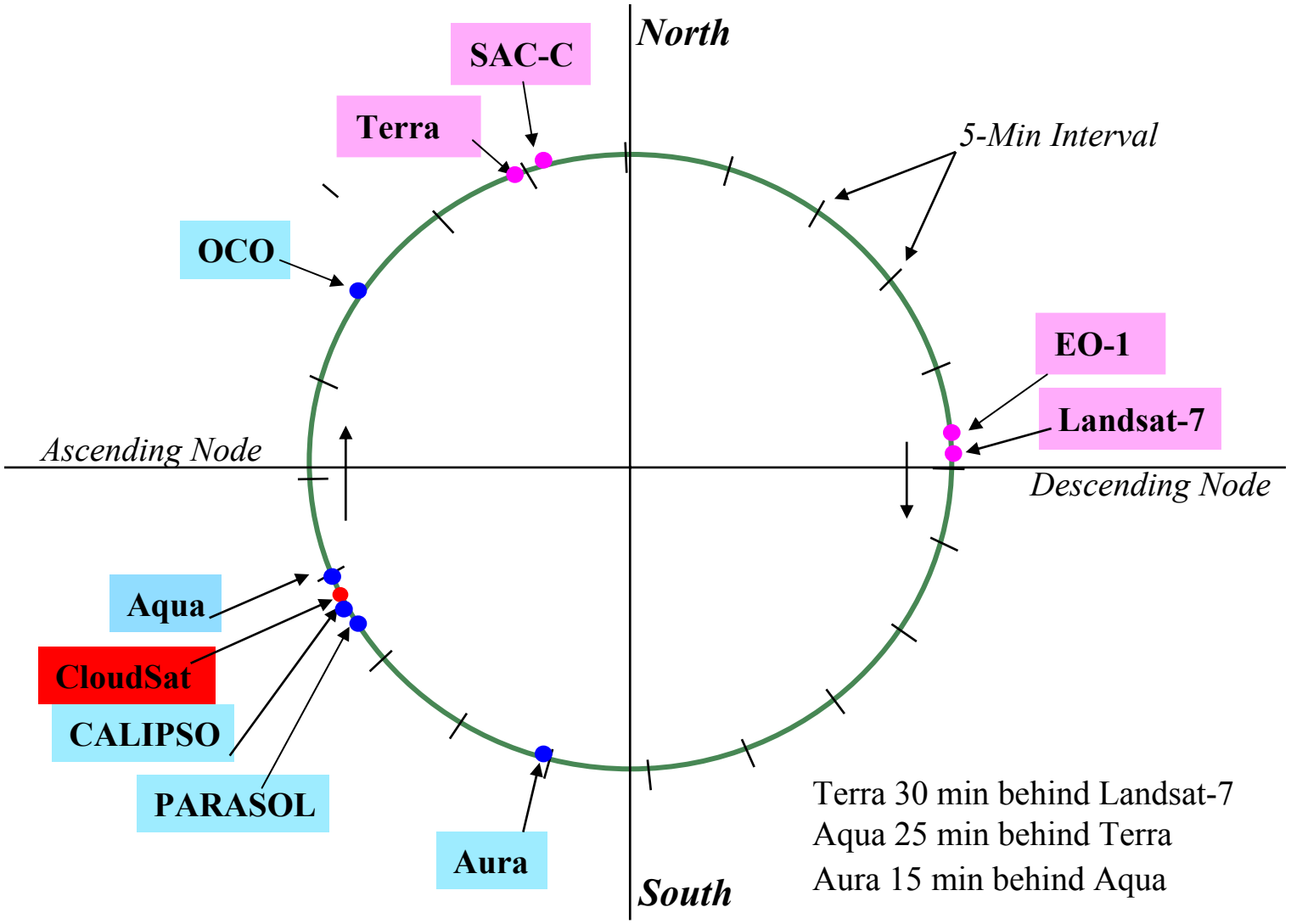


Morning and Afternoon Constellation Phasing



Tracking Station Key:
AGS – Alaska Ground Station
SGS – Svalbard Ground Station
LGS – Landsat Ground Station
TDRSW – TDRS-WEST (geo-synchronous)

Relative Positions of Satellites (one orbit) in the Morning and Afternoon Constellations (From Ground Station Perspective)



Significant Progress

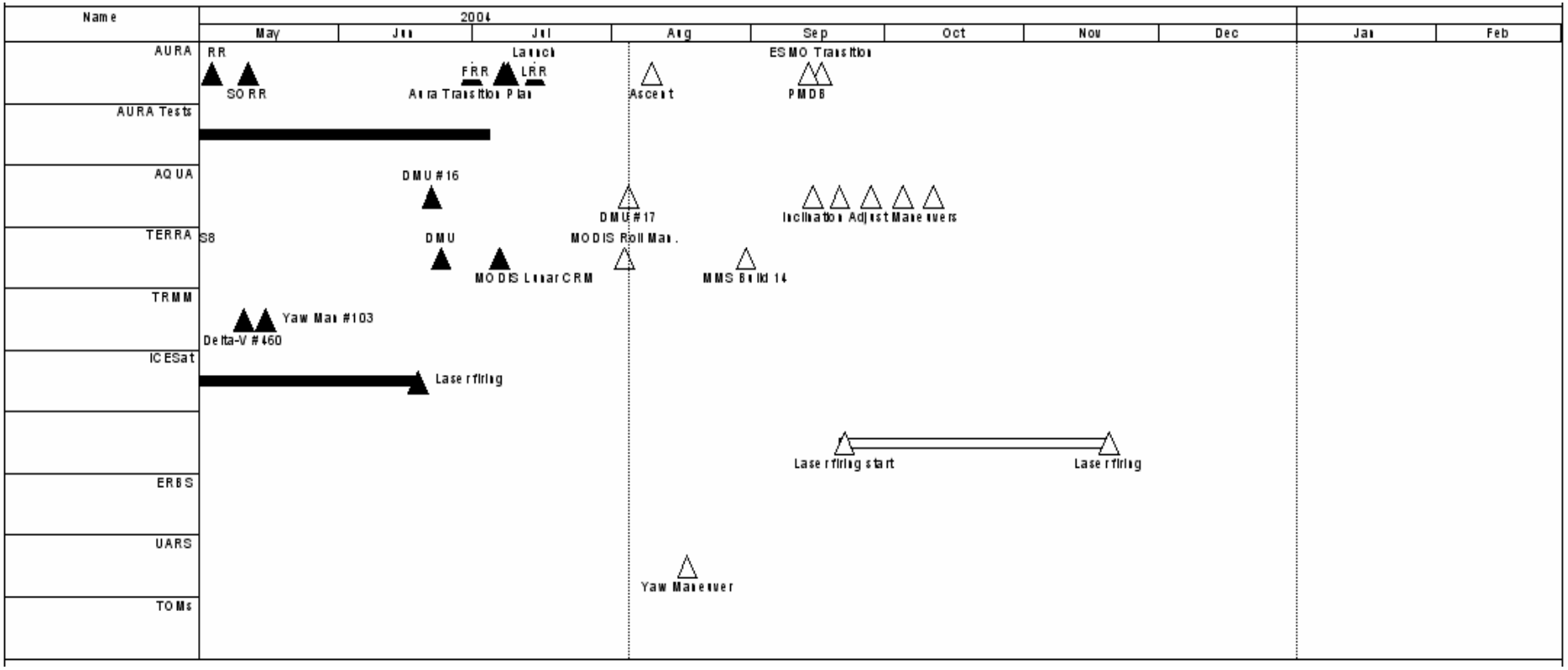
- First two elements of the A train are now on orbit
  - Parasol will join the constellation in December of 2004
  - CloudSat and CALIPSO join the constellation in late Spring of 2005
- Aqua and Aura will each conduct five inclination maneuvers on Tuesdays from 9-6 to 10-12-2004 for the remaining member missions
- ESMO provides the overall coordination for the constellation and is working collision avoidance issues for the constellation.
- Aura launched July 15th is on station and is going through instrument checkout and activation. Responsibility will transition to ESMO October 14, 2004
- ICESat will initiate its next laser campaign in the fall of 2004

Challenges

- Major activity is to phase out the ECS Development Contract by the end of January 2005.
  - This is the major technical risk/challenge facing the project.
- Need to continue to refine the metrics for network and communications support.
- Latency requirements, for example, are not yet reflected in performance.

ESMO Project Schedule
Code 428

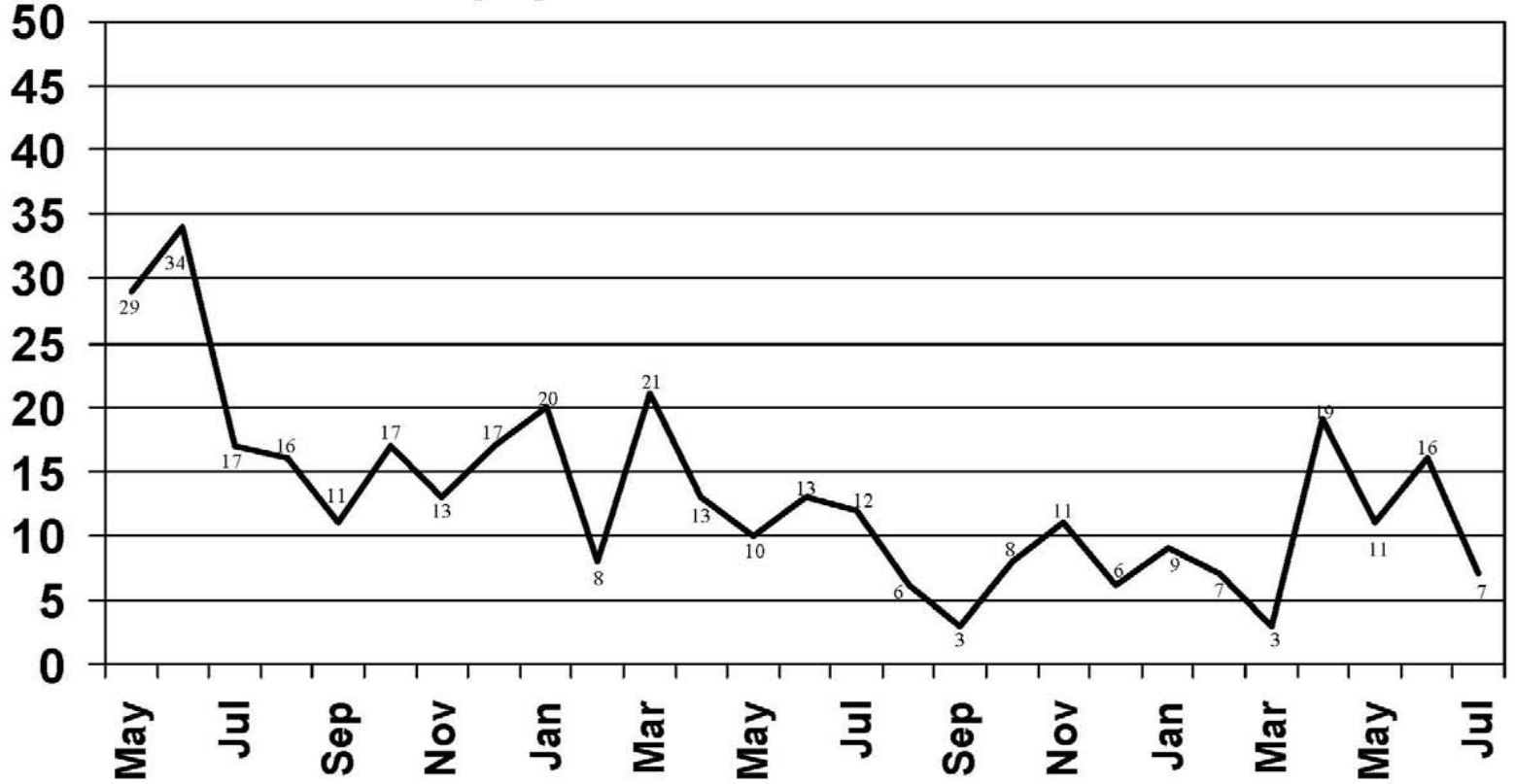
As of 7/31/04



AQUA
July Status
Combined GN Station Anomalies

LOCKHEED MARTIN

Report period 07/01/04 thru 07/30/04 DOY 183 - 207



Space Communications Customer Forum

Terra Data Capture/Delivery Metrics

	Raw Data Capture (1)	Data Received at DAACs (2)	Data Received at DAACs On Time (3)	NOAA Data Latency (4)	Comments on Significant Data Losses/Latencies
06/21/04 – 07/20/04	100.00%	98.50%	99.70%	99.40%	
05/21/04 – 06/20/04	100.00%	98.50%	99.99%	99.70%	
04/21/04 – 05/20/04	99.99%	98.49%	99.70%	99.90%	

Key: Columns (1,2,3) -> G=100%-95% (requirement), Y=94.99%-90%, R=89.99%-0%
Column (4) -> G=100%-80% (goal), Y=79.99%-70%, R=69.99%-0%

Aqua Data Capture/Delivery Metrics

	Raw Data Capture (1)	Data Received at DAACs (2)	Data Received at DAACs On Time (3)	NOAA Data Latency (4)	Comments on Significant Data Losses/Latencies
06/21/04 – 07/20/04	99.99%	99.99%	100.00%	99.50%	Aqua NOAA latency- Latency increase due to Raid and GM01 down at AGS and LZPF File Manager problems. Since 7/20 significant line problems have affected latency and increased data recovery effort.
05/21/04 – 06/20/04	99.99%	99.99%	100.00%	99.70%	
04/21/04 – 05/20/04	99.99%	99.99 %	99.45%	99.70%	

Key: Columns (1,2,3) -> G=100%-95% (requirement), Y=94.99%-90%, R=89.99%-0%
Column (4) -> G=100%-80% (goal), Y=79.99%-70%, R=69.99%-0%

Space Science Mission Operations Project (Code 444)

Ron Mahmot
Project Manager

Patrick Crouse
Deputy Project Manager

Valda Jones
Mission Business Manager

Joseph Fainberg
Senior Project Scientist

Presented at WFF Networks Conference, June 24 - 25, 2005

AGENDA

- Organization Overview
- Mission Set
- Space Link Extension (SLE)
- SSMO Bulk Buy (USN)

Organization Overview

Space Science Mission Operations Project

Charter

- SSMO has management responsibility for the safe and productive operations of Goddard Space Flight Center Space Science missions in the operations phase and for selected GSFC instrument operations on non-GSFC managed spacecraft operations
- SSMO works with missions in the development phase to feedback lessons learned and to ensure that operations concepts are sustainable
- SSMO works with the GSFC Mission Services Evolution Center (GMSEC) to ensure that the mission services infrastructure is kept current, and that technology development and infusion efforts are integrated with mission needs

Operations Philosophy

- Mission safety is the number one priority
- Goal is to maximize science data collection within budget and risk constraints

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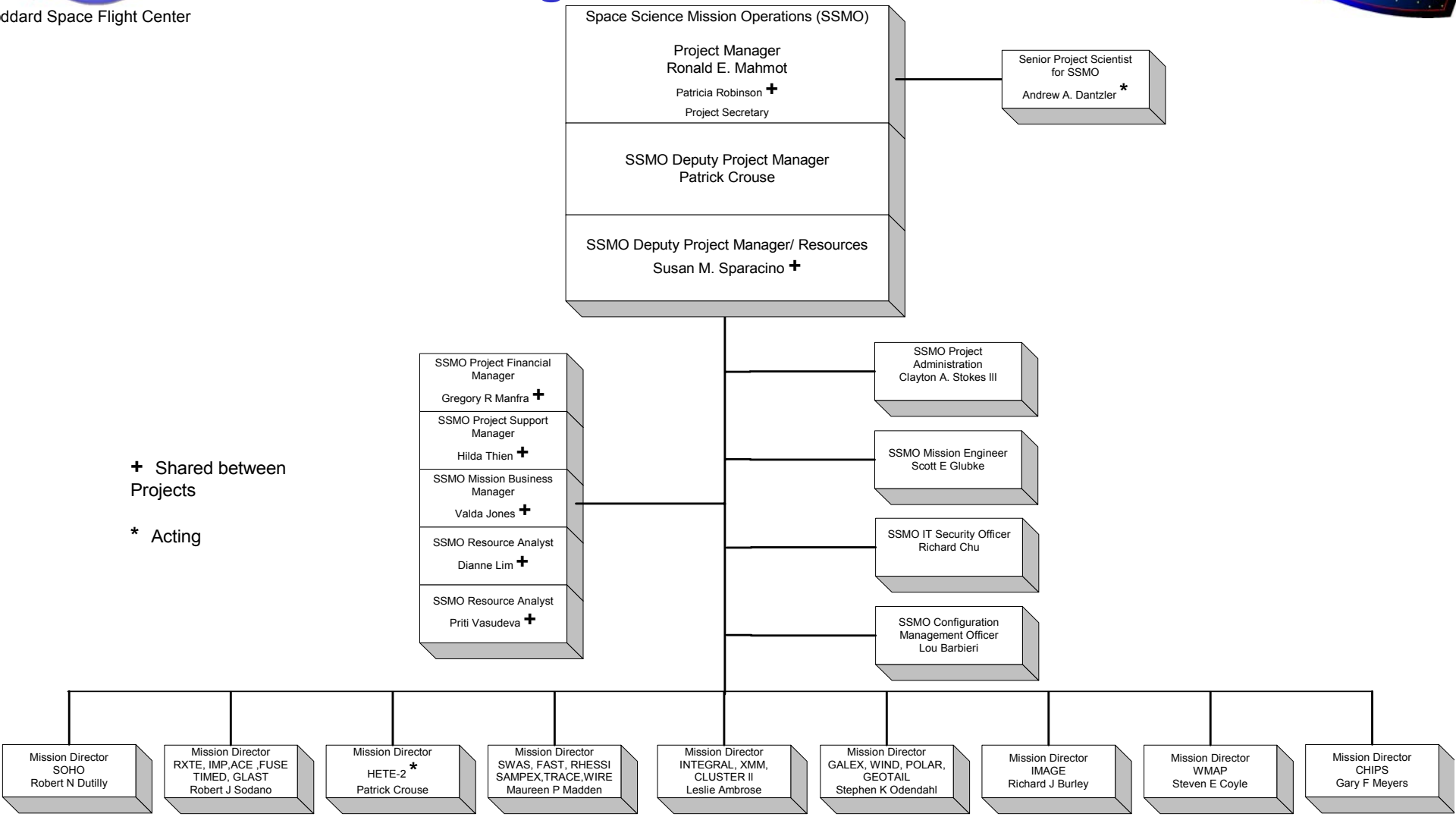
Organization Overview



+ Shared between Projects

* Acting

Original signed by **August 7 2003**

Ronald E Mahmot, Space Science Mission Operations Project Manager **Date**

Mission Set
Mission Parameters

SPACECRAFT	LAUNCH DATE	BASE/ EXTENDED MISSION	EARLIST REENTRY	Reentry Analysis Completion Date	Would uncontrolled reentry result in greater than 1 in 10,000?	NUMBER OF INSTRUMENTS	NUMBER OF INSTRUMENTS OPERATING	ORBIT
Yohkoh	8/31/1991	Dec-01	Mar-05	Dec-03	TBS	4	0	570 x 730 km @ ?
ROSAT	6/1/1990	Feb-99	Mar-06	Dec-03	TBS	2	0	539 x 554 km @ 53°
WIRE	3/5/1999	Mar. 99	Oct-07	Dec-03	No (5.8 m2)	1	0	540 km @ 97°
SAMPEX	7/3/1992	Sept. 95	Jul-09	Dec-03	No (1.4 m2)	4	4	550 x 675 km @ 82°
CLUSTER II	7/00 & 8/00	Feb. 01 & Dec. 05	2009/2010	Dec-03	TBD	4 (US)	4 (US)	3 Re x 18.5 Re Orbit @ 90°
RXTE	12/30/1995	Mar. 97	Sep-10	Dec-03	**Yes (44.1)**	3	3	565 x 583 km @ 23°
CHIPS	1/12/2003	Oct. 03	Nov-10	Dec-03	No (6.1 m^2)	1	1	600 km @ 94° inclination
RHESSI	1/24/2002	Mar. 04	Apr-11	Dec-03	**Yes (18.2)**	1	1	600 km @ 38° inclination
TRACE	4/2/1998	Jun. 00	Jul-18	Dec-03	No (6.7 m2)	1	1	600 x 650 km @ 97°
TIMED	12/7/2002	Jan. 04	Oct-24	Dec-03	**Yes (9.2)**	4	4	625 km @ 74.1°
COBE	11/19/1989	N/A	Jul-29	Dec-03	TBS	3	0	874 km @ 99°
FAST	8/21/1996	Oct. 99	Jul-29	Dec-03	No (1.2)	5	5	4150 x 348 km @ 83°
SWAS	12/2/1998	Feb. 00	Jul-29	Dec-03	No (?)	1	1	600 km @ 70° inclination
FUSE	6/24/1999	Mar. 07	Jul-29	Dec-03	No	1	1	775 km @ 25°
HETE-2	10/10/2000	Sept. 03	Jul-29	Dec-03	No (<1 m2)	3	3	625 km equatorial orbit
XMM	6/30/2001	?	Jul-29	TBD	TBS	2	2	7000 x 1114000 km @ 40°
GALEX	4/28/2003	Sep. 05	Jul-29	Dec-03	TBS	1	1	690 km equatorial orbit
Geotail	7/24/1992	Sep. 06	Centuries	Dec-03	N/A	7	6.5	8 x 210 Re equatorial
WIND	11/1/1994	Sep. 07	Centuries	Aug-03	N/A	8	7.4	L1 Orbit
POLAR	2/24/1996	Sep. 05	Centuries	Dec-03	N/A	12	10	2 x 9 Re @ 86°
IMAGE	3/25/2000	Sept. 03	Centuries	Dec-03	N/A	6	6	1000 x 45922 km @ 90°
SOHO	12/2/1995	Jan. 99	Never	Aug-03	N/A	12	12	L1 Orbit
ACE	8/25/1997	Sept. 07	Never	Dec-03	N/A	9	8.5	L1 Orbit
WMAP	6/30/2001	Aug. 05	Never	Dec-03	N/A	1	1	L2 Orbit
INTEGRAL	10/17/2002	Oct. 07	?	?	TBS	4	4	9000 x 155000 @ 51.6°

as of 6/8/2004

Mission Set
Future Missions/Strategic Planning

- Established Memorandums of Agreement with Explorers, Solar Terrestrial Probes, and Living with a Star. Structure and Evolution of the Universe agreement is pending SEU final approval
  - Involve operations early in the project life cycle (operations concept development, trade studies, best practices/lessons learned)
  - Communicate SSMO requirements and criteria for successful transition
  - Facilitate maintenance and evolution of operations infrastructure

- Working with the GSFC Mission Services Evolution Center (GMSEC) to ensure that the mission services infrastructure is kept current, and that technology development and infusion efforts are integrated with mission needs
- Some missions of particular interest:
  - Swift – Penn State operations/DAS user – October '04
  - STEREO – 2 satellites 3D Imaging of Coronal Mass Ejections (CMEs) – '06
  - THEMIS – 5 satellites, 3-4 different orbits, UCB operations – '06
  - GLAST and SDO – GSFC-based operations - '07-'08 timeframe
  - MMS – constellation operations -'12

Current Mission Set Guidance

Mission set updates per Office of Space Science guidance

SWAS and SAMPEX terminate science operations in FY04 per the Senior Reviews held in 2002 for Astronomy & Physics and 2003 for Sun Earth Connections

WIND (05), FAST (05), TIMED(06), AND TRACE (06) plans reflect earlier than expected end dates per HQ direction, pending restoration of budget

Senior Review 2004 for Astronomy and Physics MO&DA programs is in progress

- WMAP, CHIPS, GALEX, HETE-2, INTEGRAL, XMM, RXTE, FUSE
- Guidance is expected in July 2004

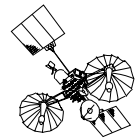
Space Link Extension (SLE) &. IP vs. CCSDS

- **SSMO is interested in SLE as a means to provide ground station interoperability**
- **The essence of SLE is two provide a standard way of accessing Space Link resources (aka, ground stations, relay satellites) using a standard connection protocol.**
- **SLE Data Services encompass the connections and flow of data with the spacecraft, as well as tracking services (in the future).**
- **When new missions begin using IP protocols and move away from CCSDS, much of what exists in the SLE standard would have to be replicated somehow.**
- **An IP protocol would still need some method of providing control and schedule of when the asset is available to the mission, they provide connection to the asset and status independent of flowing of data, and they provide status on the space link itself.**

Space Link Extension (SLE)

- SSMO agreed to eliminate use of 4800 BB communications with DSN
- DSN and ESA currently use SLE to facilitate interoperability
- SOHO SLE development effort underway
  - **Supports access to JPL/DSN stations**
  - **Enables interoperability with ESA ground stations like New Norcia**
  - **Provides security layer to ensure authorized connections**
  - **TCP protocol rather than UDP protocol provides assured delivery**
  - **Creates a pathway to retire legacy equipment supporting the NASCOM interface**

SLE Testbed Architecture



NASA WIRE
NASA COBE
AFSCN/DOD

NASA Wallops SLE Provider System (GN)
(Development Microwave System Laboratory E134)

5.4 M

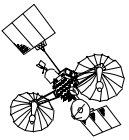
RF Production

RS-422 Patch

Avtec SLE Provider Subsystem

GST AFSCN SLE Provider Subsystem

SLE Mgmt Subsystem CM



NASA COBE
AFSCN/DOD

NOAA WCDA SLE Provider System

13 M

RF Production

RS-422 Patch

Avtec SLE Provider Subsystem

GST AFSCN SLE Provider Subsystem

NASA WSC SLE Provider System (SN)

RF Production

TBD

TBD Configuration

IP WAN (NISN SIP)

Houston SLE Laboratory

Common SLE User Test Tools

SLE User Subsystem

GST AFSCN SLE User Subsystem

SLE Management Subsystem UM/CM

GSFC - Facility (Support)

Air Force Satellite Control Network (AFSCN) CERES

Notation:

= Delivered Systems

= Future

SLE Testbed Accomplishments

- **Implemented a distributed SLE testbed infrastructure**
- **Testing showed SLE supports CCSDS, TDM and Bitstream space links**
  - Conducted successful SLE Tests using NASA WIRE **CCSDS** Satellite via the NASA WFF 5.4 m station
  - Conducted successful SLE Tests using NASA COBE **TDM** Satellite using both the NASA 5.4 m station and the NOAA WCDA 13m station
  - Air Force conducted 17 successful tests with the NASA Wallops 5.4 m station using the DOD Test and Checkout (TACO) satellite TSX-5 (**Bitstream**)
  - Air Force conducted successful downlink and SLGS Uplink (Commanding) through NOAA WCDA ground station
- **Tested the JPL developed SLE products and the Avtec PTP SLE system against CCSDS SLE RAF, RCF, and CLTU specifications**
- **SLE testbed made significant contributions towards a more mature vendor provided SLE Transfer Services product**

SOHO/SLE Application Programmers Interface

Before SOHO/SLE team design work began, evaluated multiple SLE API products including:

- NASA/JPL source code
- Anite SLE API COTS product (ESA)
- Vega (UK)
- GST (US)
- Avtec

Chose the Anite SLE API product and is requiring its use for this project for the following reasons:

- The Anite SLE API is a COTS product with available customer support.
- The NASA/JPL and ESA/Anite SLE APIs were created as a cooperative effort between the two agencies.
- Anite supports UNIX

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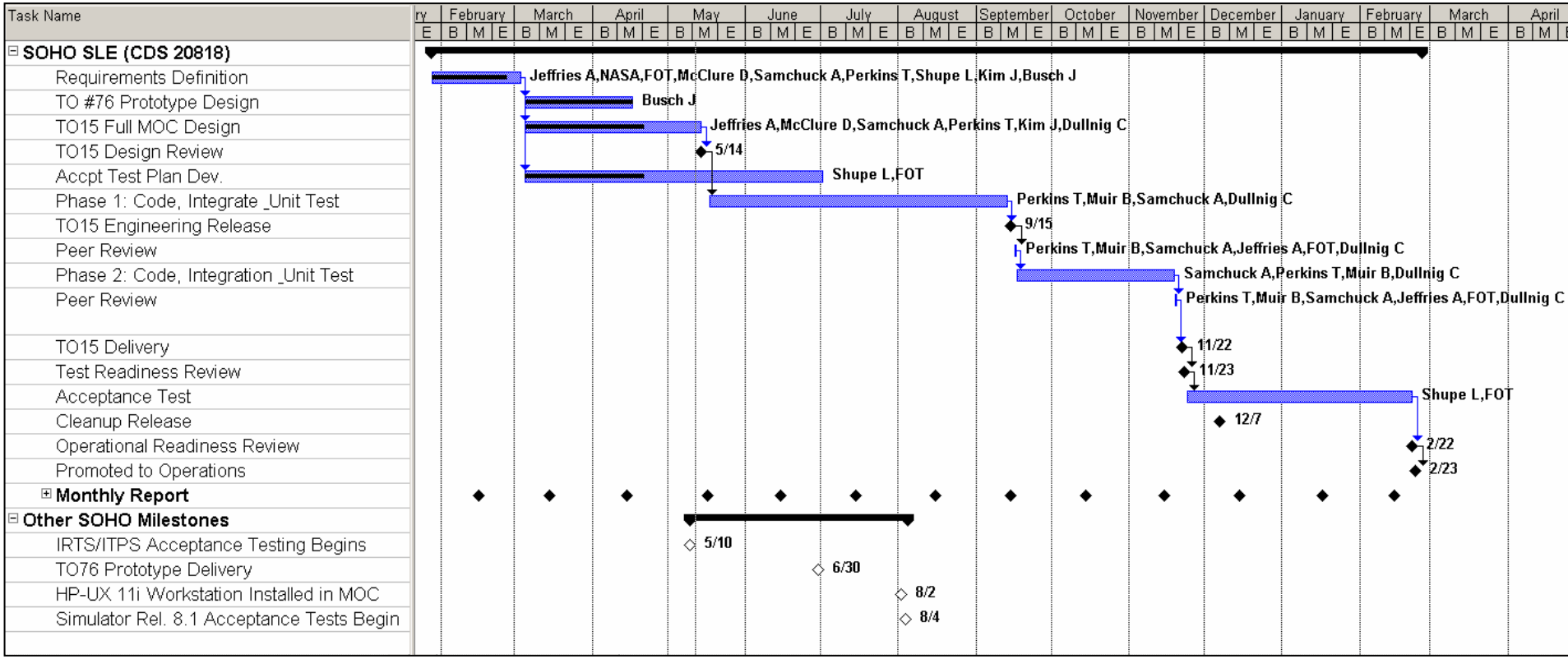
Software Development Schedule and Milestones



*** Full Featured SLE Delivery to the MOC for Acceptance Testing Projected for 23 November 2004**

Acceptance Test Phases

Phase 1: Testing with the PTP or SOHO Simulator

- This test phase will locally verify all operational scenarios and procedures.

Phase 2: Testing with the DSN

- Testing with DSN Test Facility (DTF) 21 – Interface Test for Receiving Replayed Telemetry
- Testing with DTF 21 – Interface Test for Command Receipt
- Testing with the DSN Ground Stations – Interface Test with Goldstone, Canberra, and Madrid for telemetry
- Testing with the DSN Ground Stations – Commanding
- Testing with the DSN Ground Stations – Station Handover (telemetry and command)

Phase 3: Testing with New Norcia

- Testing with ESA ESOC reference station – Interface Test for Receiving Replayed Telemetry
- Testing with ESA ESOC reference station – Interface Test for Command Receipt
- Testing with New Norcia – Telemetry
- Testing with New Norcia – Commanding
- Testing with New Norcia and DSN Ground Stations – Station Handover

SSMO Bulk Buy (USN)

- SSMO exploring business case of brokering a commercial bulk buy via a NENS Task Order
- Leverage purchase power of multiple missions to provide a flexible capacity to be shared as needed at an overall reduced cost
  - FUSE, TIMED, GALEX, and Swift have existing USN contracts
  - THEMIS will use UCB antenna but need additional support
  - Gathering data from other near-term space science missions
  - Evaluating feasibility of off-loading DSN 26m LEOP and contingency support

Searching for Win-Win amongst SSMO, USN, GN, and NENS

Mission/Project Updates

Human Space Flight

James A. Bangerter
NASA/GSFC/Code 451
Network Director
Human Space Flight

Agenda

- HSF Integrated Network Return to Flight (RTF) Status
- ISS Status

HSF Integrated Network Return To Flight (RTF) Status

- Launch now scheduled for March 6, 2005
- RTF Test Plan Published (Draft)
- RTF Re-validation Management Plan Published
- RTF Monthly Tag-up Telecons with the Network in progress
- Testing
  - Launch Count Down Testing
  - ORT & Vector Proficiency Sims
  - STA/PSS Runs
- ET TV Status
- WSSH UHF
- GUAM TV

International Space Station

- Current configuration
- Soyuz Missions
  - Soyuz 9/Expedition 10 - 10/9-11/04
- Progress missions
  - 8/13-14/04
  - 11/24/04
- EVAs
  - 8-03-04
  - 9-06-04 (TBD)

Goddard Space Flight Center

APPVL RESP Jim Bangerter

ACCOMP RESP Wm. Bruce Schneck

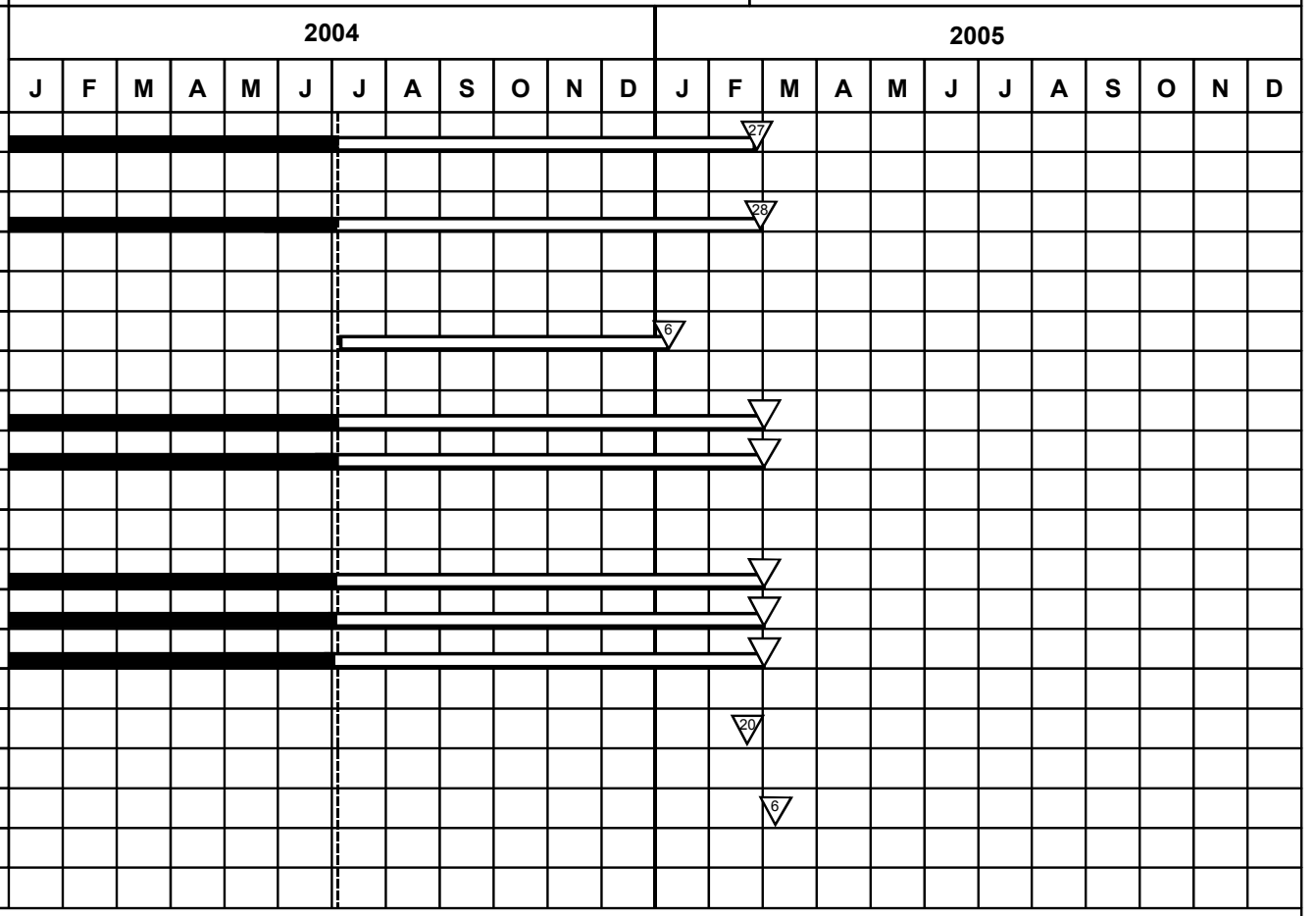
GSFC Return to Flight Activity Milestone

Level-II

Last Sched Change: 7/1/04

Status as of: 7/1/04

Integrated Networks RTF Test Plan



Notes: